YALE UNIVERSITY LIBRARY
3 9002 06584 7304

PROTEIN MALNUTRITION IN THE PRE-SCHOOL CHILD AND ITS ALLEVIATION: A STUDY IN MONTERO, BOLIVIA

Arnold Fredric Mazur

1969

MUDD
LIBRARY
Medical

YALE

MEDICAL LIBRARY

YALE

MEDICAL LIBRARY

Digitized by the Internet Archive
in 2017 with funding from
Arcadia Fund

https://archive.org/details/proteinmalnutrit00mazu

PROTEIN MALNUTRITION IN THE PRE-SCHOOL CHILD AND ITS ALLEVIATION: A STUDY IN MONTERO, BOLIVIA

by

Arnold Fredric Mazur

B.A. Brooklyn College, 1965

A thesis presented to the
Faculty of the School of Medicine
Yale University

in partial fulfillment of the
requirements for the degree
Doctor of Medicine

Yale University School of Medicine
Department of Epidemiology and Public Health
New Haven, Connecticut

1969

YALE MEDICAL
JUN 1969
LIBRARY

DEDICATION

To my mother, for a lifetime of love and inspiration

ACKNOWLEDGEMENTS

I wish to thank Dr. James Alley for his guidance during two summers of work in Montero, Bolivia. Dr. Richard Greenberg provided invaluable assistance with the statistical aspects of the paper. And Dr. Richard Weinerman gave of his time to read and criticize the manuscript. Lastly, a great debt is owed to Timothy Pedley, Peter Nicholas, Nancy Gates and Alice White for inspiration during the difficult early days.

AFM

TABLE OF CONTENTS

Introduction.....1

Methods.....8
- I. Family diet study
- II. Milk consumption and attitude survey
- III. Weight measurement of children
- IV. Analysis of clinic data
- V. Observation of child feeding practices
- VI. Conversations with physicians, public health nurses and businessmen.

Results.....14
- I. Duration of breast feeding
- II. Age at onset and severity of protein malnutrition
- III. Diet and family income
- IV. Family diet study
- V. Mothers' knowledge of nutrition
- VI. Milk in the child's diet
- VII. Milk consumption in Montero

Discussion.....30

Summary.....42

Appendices
- Appendix I.....45
- Appendix II.....50
- Appendix III.....52
  - IIIa.....60
  - IIIb.....70
- Appendix IV (Maps A-D).....80
- Appendix V.....85

Bibliography.....88

LIST OF TABLES

Table 1. Population Distribution in Montero.....5
Table 2. Living Conditions in Montero.....6
Table 3. Duration of Breast Feeding.....14
Table 4. Weight Levels and Malnutrition in a group of Infants and Pre-School Children Participating in the CSM Supplementary Feeding Program in Montero, Bolivia.....16
Table 5. Weight Levels and Malnutrition in Infants and Pre-School Children Whose Families Participated in the 1968 Survey of Milk Consumption and Attitudes in Montero, Bolivia.....18
Table 6. Food Totals for the Week for One Family.....22
Table 7. Food Totals for One Meal.....23
Table 8. What Mothers in Montero Feel are the Best Foods for Children in General and Specifically When They are being Weaned.....25
Table 9. Daily Milk Consumption of the One to Three Year old Child.....26
Table 10. Milk and Other Protein Foods Sold in Montero.....28
Table 11. Milk Usage, Popularity and Cost.....29
Table 12. Prevalence of Protein-calorie Deficiency Disease in Some Less-developed Countries (Patwardhan, 1964).....31

Appendix Table A. Protein Requirements of Children and Adults and the Effect of Protein Quality (FAO, 1965).....48
Appendix Table B. Protein Percentage and NPU Values of Selected Protein Foods....49

LIST OF FIGURES

Figure 1. Scatter graph of weight for age of 87 children between 0 and 5 years whose families were interviewed in the 1968 Survey of Milk Consumption and Attitudes in Montero, Bolivia.....33

INTRODUCTION

Protein deficiency is the most serious and widespread dietary deficiency in the world. Although it has undoubtedly been a serious problem throughout history, recognition and study of protein malnutrition did not begin until the middle of the 1930's. During the first part of the twentieth century the vitamin concept dominated scientific thinking, almost to the exclusion of other research in nutrition. Then in 1933, C.D. Williams, a British pediatrician working in the Gold Coast (Ghana) published the first comprehensive account of a disease in children which had its onset at one to three years of age, and was fatal unless treated (Williams, 1933). She ascribed the disease to malnutrition, since the children who had been living on a maize diet were cured by feeding them milk. She named the disease "kwashiorkor", from an African dialect word meaning " a disease occurring in a young child displaced from his mother by a subsequent pregnancy" (Williams, 1935).

During the next twenty years kwashiorkor was recognized and described in more and more countries of the underdeveloped world. These reports are reviewed by Trowell, Davis and Dean (1954). Dietary histories, the constant finding of hypoproteinemia and the response to treatment with milk were the most important evidence that the disease syndrome was due to a severe deficiency of protein.

Kwashiorkor can occur in infancy or in later childhood and rarely in adult life. Classically its main incidence is between one and three years of age (Gomez et al, 1954; Waterlow, 1948; Trowell et al, 1954). During this period the child's protein needs are high; breast milk alone after the first four to six months of life does not provide sufficient protein (Waterlow, 1960) and the traditional weaning diets in most underdeveloped countries are almost completely lacking in high protein food (Swaminathan, 1967; Scrimshaw and Behar, 1965).

Kwashiorkor is the advanced stage of protein malnutrition. Lesser degrees are much more common and form a continuous gradient between the obvious severe clinical case and the well-nourished, healthy child. The initial manifestation is a decreased growth rate. A number of studies have indicated that at the time of weaning the growth rates of children in developing countries begin to deviate sharply from the normal and continue at a low level thereafter, resulting in stunted

adult stature (Jelliffe, 1955; Downs, 1964; Jelliffe and Jelliffe, 1960; Scrimshaw and Behar, 1965).

Protein deficiency arises either from lack of adequate food supplies within a region or from social, economic and cultural factors that limit the consumption of protein by vulnerable groups of the population even when total supplies are adequate (Jelliffe, 1957).

In Montero, Bolivia, the community we have investigated, previous clinical work demonstrated the presence of protein deficiency disease. It was the purpose of our study 1) to determine the prevalence of protein deficiency in the infant and pre-school child[1] population and 2) to discover those factors responsible for the deficiency. We have focused on the role of milk in the diet of the pre-school child and have examined the potential for using it to alleviate protein deficiency.

General Description of Montero

Montero is a town with 15,000 inhabitants located in the eastern topical lowlands of Bolivia, in the state of Santa Cruz (Appendix IV, Map A). To the west of Montero are the foothills of the Andes Mountains. Forests, jungles and

[1] Pre-school child is generally defined as and hereafter refers to a child from twelve through fifty-nine months of age.

plains covered with rough pasture border the town on the north, south and east. The climate of the region is hot, with a mean annual temperature of about 75°F. Rainfall is heavy but seasonal and large areas of land undergo alternate flooding and drought each year.

The Montero region is primarily agricultural. Before 1956 it was mostly subsistence or for local market consumption. Since then, with the completion of a paved highway linking Montero to the more populous western region of Bolivia, commercial farming has rapidly grown to assume prime importance. The main crops are sugar cane and rice, but yuca, corn, cotton and a variety of fruits are also grown. Cattle and hog raising is pursued to a limited extent. Basic agrarian reform was one of the results of the Bolivian revolution of 1951-1952. This resulted in the establishment of ten farming colonies within fifty miles of Montero (Appendix IV, Map B). Located at the center of this rapidly growing area and linked to all of the colonies by paved roads, Montero has increased its population from 2,500 in 1955 to 15,000 in 1967 (Appendix IV, Map C).

The population of Montero is predominantly young with almost 60 percent under the age of twenty and 90 percent under the age of forty-five (Table 1). There is a high birth rate and a mortality rate which has dropped considerably with recent improvements in public health.

Table 1.

Population Distribution in Montero

Age (in years)	Percentage
0-1	3.3
1-4	14.4
5-19	40.1
20-44	31.6
45-64	8.6
65	2.0
Total	100.0

Montero has electricity, telephones and a potable water supply circulated by a central pump. However, these services are available only to those who can afford them. Table 2 presents pertinent information concerning environmental health and living conditions.

Medical care in Montero is provided at a twenty bed public hospital, with a delivery room, an operating room and a daily out-patient clinic. The hospital is staffed entirely with Bolivian personnel, including an M.D., M.P.H. director, and two interns. Two maternal-child health centers are also staffed by several full-time nurses and the interns on a part-time basis. There are five practicing private physicians in the town but high fees prevent the average family from obtaining regular health care from them.

The population of Montero is predominantly mestizo, the result of an intermingling during the past four centuries

Table 2.

Living Conditions in Montero[2]

Houses without electricity	74 percent
Houses without toilet or latrine	34 percent
Houses without potable water	67 percent
Houses with dirt floor	48 percent
Houses with mud or palm walls	61 percent
Houses with palm roofs	51 percent
Birth rate per 1,000 population	44
Death rate per 1,000 population	36

[2] Encuesta de Salud de la localidad de Montero, Obra Medica de la Inglesia Metodista, Montero, 1965, unpublished.

between the indigenous Indian inhabitants and Spanish settlers. Caucasians primarily of Spanish ancestry, and Indians who have immigrated during the past twenty years from the mountainous western half of Bolivia, comprise the remainder of the population.

The upper and middle classes in Montero consist of merchants, commercial farmers, ranchers and professionals. About 50 percent of the lower class males are agricultural laborers on large farms and plantations. Others are chauffeurs, housebuilders and brickmakers. Many lower class females work as servants, cooks, seamstresses and vendors in the town market. Some bake bread at home which their children then try to sell in the streets.

The wages for agricultural laborers average $b.12 (12 pesos bolivianos) or 96 United States cents per day for a six day work week.[3] This amounts to $5.76 per week or approximately $250.00 for a forty-four week work year (many men are unemployed during the rainy months of January and February).

---

[3] one peso boliviano ($b.1) equals $.08 of United States currency. Hereafter all references to money will be made in terms of United States currency.

METHODS

The research for this study was carried out in Montero, Bolivia during July, August and September of 1967, and June and July of 1968. It consisted of a family diet study, a milk consumption and attitude survey, weight measurements on infants and pre-school children, observations of child feeding practices, conversations with physicians, public health nurses and businessmen, and analysis of certain clinic data.

I. Family diet study

One family was selected from amongst those attending a pre-school child clinic. After having been introduced to the mother by a public health nurse who knew the family I established personal rapport with the family during several home visits, and then secured permission from the mother to visit with them daily for seven days to learn how they prepared and ate their food. I explained that I would be weighing all of the food and showed how it would be done.

During the week that followed, I recorded and weighed (before preparation) on a 500 gram spring scale all of the food that the family ate. For the first two days individual portions of food were also weighed and from these determinations I calculated the percentage that each person was eating of the total. These percentages were then used to calculate each person's intake during the following five days when individual portions were not weighed. Food prices were checked in the market and the nutrient value of the foods eaten was determined from INCAP food composition tables for use in Latin America (INCAP, 1964).

II. Milk consumption and attitude survey

Interviews in Spanish using a standardized, pre-tested questionnaire (Appendix III) were carried out on fifty randomly selected households from the total number of "poor", Spanish-speaking households in Montero. All eligible households met the following criteria: they had at least one child between the ages of one and three (the age group most susceptible to the development of protein deficiency disease); each family had a palm roof, palm or mud walls, dirt floor, no electricity and no potable water. The interview in each case was held with the mother or other woman who took care of the children.

To simplify the work of the survey the geographical boundries of Montero were arbitrarily defined, not coinciding

exactly with the actual limits of habitation. Only houses within these defined boundaries were included in the survey.

Within Montero every street[4] which had at least one house with a palm roof and mud or palm walls was numbered. Using a random number table, 50 streets were selected from the total number eligible. From each of these fifty streets one household was to be randomly selected from all of those eligible. If no eligible household on the street was found, that number was discarded and another selected. This procedure was followed until a total of fifty families on fifty different streets had been interviewed (Appendix IV, Map D).

If a house was visited and found to be unoccupied, an effort was made to learn about the occupants from neighbors. Then, if it was still unoccupied after three visits, it was considered ineligible.

The survey was limited to Spanish-speaking households because it was felt that it would be too difficult to deal with the problems of translating from Quechua to Spanish and then to English.

The results of the interviews were not weighed to take account of the fact that there was not an equal number of eligible houses on each street. Thus, a house on a street

---

[4] Street, in the context of this paper is a unit equivalent to the following example: Park Road, between Seventh and Eighth Avenues, on the left side.

with fewer eligible houses had a greater chance of being selected. This would tend to over-emphasize the results from streets where there were fewer eligible houses. However, it was our observation, although unsystematic, that the number of eligible households on any particular street did not vary more than from zero to three. The fact that the number varied so slightly, would tend to lessen the potential error resulting from the unequal weighing of streets, as would the fact that almost all of the families interviewed lived on streets where their neighbors were also of the low socio-economic class. On the basis of the above observations, we have assumed therefore that households meeting our criteria were not significantly different from one street to another, and that our results hopefully were representative of the entire population under study.

III. Weight measurement of children

Determining weights in a representative group of children and then correlating weight with age has been found to be the most useful measurement for estimating the nutritional status and the prevalence of protein malnutrition in the infant and pre-school child population of a community (Jelliffe, 1966). In each of the fifty families interviewed in the above survey, the person interviewed was given an identifying paper and asked to appear at the hospital the following Saturday morning

to have the children weighed (Appendix III, p.58). Measurements were done on a platform balance scale with precision to the nearest half of a kilogram and accuracy of the scale was checked each day. The children were weighed with light indoor clothing and no shoes. Infants and unco-operative children were weighed while being held in the arms of a person of known weight.

IV. Analysis of clinic area

Records at the two maternal-child health clinics were examined of all the children up to sixty months of age who had taken part in the CSM[5] Feeding Project from November 1967 to July 1968 to learn how long they had been breast fed, and what level underweight[6] they had been upon enrolling in the program.

V. Observation of child feeding practices

Observation of child feeding practices was carried out by visiting the homes of clinic families, observing the preparation and serving of food and questioning mothers about

---

[5] CSM stands for corn, soya, milk, a special supplement supplied by the Food for Peace Program.

[6] The weight of each child had been recorded on a chart which, according to the system of Gomez(1955), categorized the children into different degrees of malnutrition according to the relation of their weights to a standard weight (Table 4).

what they fed their children.

VI. Conversations with physicians, public health nurses and businessmen

Conversations focusing on patterns of medical care in Montero, evidence of protein malnutrition and efforts to alleviate it were held with Dr. Rene Balderas the Bolivian director of the hospital, and Dr. James Alley the American director of the Consejo de Salud Publico (Public Health Council in Montero). The Bolivian public health nurses provided information on child feeding practices, health and general living conditions of the poor families in town. Information was gathered from milk producers and distributors on current sources of milk, the percentage that each source contributes, and prospects for increased production in the future.

RESULTS

I. Duration of breast feeding

The duration of breast feeding of children in poor families in Montero was ascertained. Each of the fifty mothers participating in the milk survey[7] was asked how long she had breast fed her last child.

Table 3.

Duration of Breast Feeding

Period of Breast Feeding	No. of Children	% of Total
0 months	3	6
1-5 months	5	10
6-11 months	8	16
12-17 months	23	46
18 months and more	11	22
	50	100%

[7] A complete tabulation of the results of the Milk Consumption and Attitude Survey is printed in Appendix III a.

Six percent of the children had not been breast fed at all. Of those who had been breast fed, the mean period was 13 months. As shown in Table 3, 46% of the children received breast milk for 12-17 months. Seventy percent of the children had been breast fed for at least a year, and 22 percent for a year and a half or longer. These results differ somewhat from the estimate conveyed by the American public health physician in Montero. It was his impression that breast feeding of the lower class children continued for a longer period of time, averaging eighteen months. There was a close correlation between what the mothers said actual duration of breast feeding had been (13 months), and what they felt was the optimum period of breast feeding (12 months).

II. Age at onset and severity of protein malnutrition

As described earlier in this paper, measuring weights in a representative group of children, correlating weight with age and then comparing this with a standard weight-age table is a useful means of estimating the prevalence of protein malnutrition.

Table 4 contains information on malnutrition in a group of children participating in the CSM Feeding Program in Montero. Each child's weight and age were recorded when he enrolled, before receiving any supplementary food. The clinic record of every participant under sixty months of age was screened for the information in the table. The categories in Table 4

Table 4.

Weight Levels and Malnutrition in a Group of Infants and Pre-School Children Participating in the CSM Supplementary Feeding Program in Montero, Bolivia.

Age (months)	Number Examined	Levels Underweight for Age			Mild-moderate protein-calorie malnutrition	Severe protein-calorie malnutrition
		% in 1° malnutrition 90%-75% of std. wt.	% in 2° malnutrition 74%-61% of std. wt.	% in 3° malnutrition 60% & below of std. wt.	90%-61% of std. wt.	61% and below of std. wt.
0-4	22	14%	0	0	14%	0
5-11	24	42%	8%	0	50%	0
Total 0-11	46	28%	4%	0	32%	0
12-23	28	54%	36%	4%	90%	4%
24-35	23	65%	9%	4%	74%	4%
36-47	17	65%	24%	0	89%	0
48-59	11	64%	27%	0	91%	0
Total 12-59	79	60%	24%	3%	84%	3%
Total 0 -59	125	48%	17%	2%	65%	2%

are based on the system of Gomez (Gomez, 1955), using Mexican children as standards. It can be seen that of the infants under five months of age only 14 percent have any degree of protein-calorie malnutrition, and these are all in first degree or mild level. In the next age group, five through eleven months, the total percentage of infants with mild - moderate malnutrition jumps to 50 percent, with 8 percent of them now in the second degree of malnutrition. The age group twelve through twenty-three months shows a further large jump in the percentage of children with malnutrition to 94 percent, with many in the more severe degrees of malnutrition. From twenty-four through fifty-nine months of age the percentage of children with malnutrition remains very high, around 90 percent, but never as high or severe as in the group between twelve and twenty-four months of age.

Table 5 contains data similar to that in Table 4, but derived from measurements done on all of the children between zero and five years of age in forty-four of the fifty randomly selected poor families interviewed in the nutrition survey (see Appendix V. for a detailed correlation of age and weight measurements). Six families with a total of nine children under five years of age did not come to the hospital for weight measurements[8]. Using the modified Harvard weight standards

---

[8] The format of Table 5 differs slightly from that of Table 4. Following the method of Jelliffe (1966), weights below standard for age are divided into four levels instead of three. However, the divisions of mild-moderate and severe protein-calorie malnutrition are the same.

Table 5.

Weight Levels and Malnutrition in Infants and Pre-School Children Whose Families Participated in the 1968 Survey of Milk Consumption and Attitudes in Montero, Bolivia

Age (months)	Number Examined	%in 1st level Underweight	%in 2nd level Underweight	%in 3rd level Underweight	%in 4th level Underweight	Mild-moderate protein-calorie malnutrition	Severe protein-calorie malnutrition
		90%-81%	80%-71%	70%-61%	60% & below	90%-61%	60% & below
0-4	6	0	0	0	0	0	0
5-11	7	57	29	0	0	86	0
Total 0-11	13	31	15	0	0	46	0
12-23	23	39	22	4	13	65	13
24-35	28	39	18	7	0	64	0
36-47	8	38	0	0	0	38	0
48-59	15	15	40	33	0	73	0
Total 12-59	74	39	20	4	4	64	4
Total 0 -59	87	38	20	3	3	61	3

(Vaughan, 1964) as our reference, we have equated standard weight for age with the 50th percentile of any weight for age in the Harvard Tables. The weights for male and female have been combined so that each standard weight for age is an average of the two (Jelliffe, 1966).

The infants less than five months old who were examined were all of normal weight for age. This compares closely with 86 percent normal in the same age group in Table 4. In the five to eleven month age group the percentage of children with malnutrition increased sharply to 86 percent. The comparable group in Table 4 also showed a sharp increase, but only from 14 to 42 percent. With only seven children in the group, the significance of this result may not be statistically valid. In all of the subsequent age groups, between twelve and fifty-nine months the percentage of children evidencing malnutrition remains high, averaging 68 percent. The most serious malnutrition is found in the twelve to twenty-three month olds, with 17 percent of these in the third or fourth level underweight. This same group was also most severely affected in Table 4.

Table 3 shows that 84 percent of the mothers had breast fed their last child for longer than five months, with thirteen months being the mean. Comparing Table 3 with Tables 4 and 5 it is evident that until five months of age the incidence of protein-calorie malnutrition is very low. It increases

dramatically in the five to eleven month age group, most of whom are still receiving breast milk. It reaches its greatest severity in the twelve to twenty-three month olds, the age period when most of the children are weaned.

III. Diet and family income

Observation of feeding practices in lower class homes showed diets to be very simple with little variety. Rice, noodles and yuca are the staple foods. Oranges, bananas and grapefruits are eaten in season. White bread and coffee with sugar is the most popular between meal food. Pre-school children after they have been weaned eat the family meals without regular special food supplements. Although meat, eggs, milk and poultry are all readily available in Montero, they are not eaten in substantial quantities by the lower class families.

It was hypothesized that family income was a significant factor limiting the diet, and our results showed that the family was spending for food each week an amount of money equal to the weekly earnings of the head of the family ($6.40). However, there was an average of two wage earners per family, with 58 percent of the mothers working, averaging $2.64 per week. Thus, in houses where both the head of the family and the mother worked, the total income would be $9.04, of which $6.40 was for food.

IV. Family diet study

The diet of one family was observed in detail for a week (Table 6). Although not necessarily representative of all poor families, it was typical of many families visited. The family consisted of father, mother and six children aged sixteen, eleven, nine, five, two and three quarters and two months. The 2 3/4 year old child had been weaned nine months earlier, and the two month old infant was currently being breast fed. The father was an agricultural laborer, with weekly income of $5.76 ($b.72) for six days work. The mother was taking care of the children at home, although she had worked previously and intended to return to work when her infant was old enough. Neither parent was literate, but the two oldest children were in school.

The cost of food for the week was $4.40 ($b.55), 76 percent of the father's income. Rice was the staple food, supplying approximately 40 percent of the total calories and 50 percent of the total protein. The total protein for the week was approximately 1,200 grams of which 38 percent was animal protein. Animal foods were the most expensive items in the diet, costing $1.48 for 1.5 kilograms of meat and fish. This represented one-third of the food budget for the week. No milk or eggs were bought, although the mother said that she used them when she was able to afford them.

Table 6.

Food Totals for the Week for One Family

Food	Quantity (grams)	Calories	Cost ($US)
rice	7,500	27,000	$0.72
sugar	2,000	8,000	.32
white bread	2,000	6,400	.64
lard	700	6,300	.48
bananas	5,000	5,500	-
meat			
fresh beef	900	2,350	
pork sausage	50	200	
pork	130	350	1.48
semi-dry beef heart	210	650	
fish	280	300	
noodles	650	2,200	.12
yuca	1,600	2,000	.04
wheat flour	460	1,600	.12
beans	400	600	-
tomatoes	500	300	.08
potatoes	300	250	-
coffee	-	-	.20
salt	-	-	.04
cabbage	-	-	.04
soup vegetables	-	-	.04
grapefruit	1 unit	50	-
TOTAL		64,050	$4.40

A better appreciation of the family diet may be gained from the following presentation of a meal eaten during the week of the study (Table 7). The meal consisted of rice and onions boiled together with lard, and a grapefruit divided amongst the children.

Table 7.

Food Totals for One Meal

Foods	Quantity (grams)	Calories	Protein(grams)
rice	700	2,500	50
onion	20	0	0
lard	50	450	0
grapefruit	1 (units)	50	0
TOTALS		3,000	50

During cooking the weight of the rice increased fourfold from 700 grams to 2,800 grams due to absorption of water. The 2 3/4 year old child ate 400 grams of wet rice cooked with onions and lard, and a small piece of grapefruit. For this bulky meal his total protein intake was seven grams; total calories were 450. Although at this particular meal he ate all of the food placed before him, at several other meals during the week he left over food, unable or not wanting to empty his plate.

The 2 3/4 year old had been weaned at two years of age, and since then had been eating the regular family diet.

During the week of the study his protein intake averaged twenty grams per day. Of that total, six grams was animal protein and fourteen grams was vegetable protein (primarily from rice). To determine how completely the child's protein requirements were met at that daily intake, a Net Protein Utilization (NPU) value of sixty-five was used as an approximation of the quality of his dietary protein. (see Appendix I for details of the method and calculations). The protein requirement after correction for wastage in food before consumption was 1.82 grams per kilogram of body weight daily. At a weight of twelve kilograms the total daily requirement was twenty-two grams. Since his average intake was twenty grams he was receiving 90 percent of the requirement for his weight. However, if we take into account that his weight (twelve kilograms) was only 83 percent of the standard weight[9] of a child 2 3/4 years of age (fourteen kilograms) and correct for the discrepancy, it can then be seen that his protein requirement would be twenty-nine grams daily if he were at standard weight for his age. Thus, the child was receiving only 69 percent of the protein requirement of a child at standard weight for that age, and his diet was already quite high in bulk.

---

[9] Modified Harvard Standard

V. Mothers' knowledge of nutrition

The average education level of the respondents was 2.6 years of primary school and almost all were illiterate. But the majority appeared to have some awareness of nutrition. Seventy-four percent said that milk, meat and eggs are the best foods for children, and 68 percent said that milk is the best food at weaning time (Table 8).

Table 8.

What Mothers in Montero Feel are the Best Foods for Children in General and Specifically When They are Being Weaned.

	Juice	Milk	Meats & Eggs	Vegetables	Other	Don't Know
During Weaning	14%	68%	---	---	16%	2%
Children in general	---	58%	16%	8%	14%	4%

Contrary to the expectation we had of finding the grandmother to be the most important source of a mother's concepts on child feeding and nutrition, we found that medical personnel were mentioned most frequently (38 percent of the responses), as the ones having taught the mother about milk. In only 9 percent of the homes where a grandmother was living, was she mentioned by the mother as the person who had taught her about milk, or knew the most about children's nutrition.

VI. Milk in the child's diet

We have already seen that 58 percent of the mothers considered milk to be the best food for children, and 68% felt that it was the most important food for weaning children (Table 8). The main reasons stated were that it has vitamins, is nutritious and helps children grow. Seventy percent of all the respondents felt that a child needs milk until at least three years of age. Thirty percent stated that milk was needed beyond the age of five. In 73 percent of the families the child between one and three years of age was drinking the most milk. Table 9 shows his daily consumption. Four out of five of these children are drinking at least two cups of milk daily, a quantity which would supply them with a minimum of twelve grams of protein if the milk were undiluted.

Table 9.

Daily Milk Consumption
of the One to Three Year Old Child

Number of Cups	Percent
Less than two cups[10]	13%
Two to three cups	23%
Three or more cups	57%
Don't know	7%

[10] One cup is approximately six ounces.

The above results contrast sharply with the milk buying patterns of the families. Seventy-seven percent had no milk in the house. Asked when they had bought milk last and when

they were going to buy it again, 54 percent gave answers indicating that they purchased milk infrequently. Fifty-eight percent of the families said that they used fresh cow's milk. But of these families, only 10 percent had bought a bottle that day. Fifty-two percent had not bought and did not intend to buy any milk "yesterday, today, or tomorrow". Half of the families said that they used powdered milk. But of these, only 16 percent knew the correct dilution of milk powder to water.[11]

There are four types of milk sold in Montero: fresh cow's milk, powdered whole milk, powdered skim milk, and evaporated milk. Evaporated milk was not included in our survey because it is used in negligible quantities and its price is too high for a family of low income to afford. The other three types of milk are presented in Table 10 with the price for the units in which they are sold, and the quantity of protein which each will supply for $0.08(one peso boliviano). Also included in the table for comparison are other high quality protein foods available in Montero.

---

[11] The correct dilution is five or more teaspoons of milk powder per cup of water.

Table 10.

Milk and Other Protein Foods Sold in Montero

	Protein percent[12]	Price per unit	Protein grams for $0.08	Equivalent in grams of reference protein[13] for $0.08
Cow's milk:				
fluid, whole	3.5	$.16/liter	18	14
powdered, whole	26.5	$.80/lb.	12	9
powdered, skim	35.0	$.96/kg.	29	22
Eggs:				
whole, fresh hen's	11.3	$.05/egg	10	10
Beef:				
raw, very thin	21.4	$.64/kg.	25	20

[12] derived from food composition tables in INCAP (1964)

[13] grams of reference protein = grams of protein X NPU/100

As can be seen, the amount of protein that one can buy for $0.08 varies greatly in each of the three types of milk, from nine to twenty-two grams. However, the lower cost of a particular type of milk bears no direct relation to either its frequency of usage or people's opinion of it (Table 11). Of the families who said that they were using milk, only two percent were using powdered skim milk, the cheapest type. Only 9 percent were even familiar with it by name. Powdered whole milk, the most expensive type of milk, was used by 26 percent, and considered to be the best milk by a majority of the respondents.

Table 11.

Milk Usage, Popularity and Cost

Type of Milk	Percentage of people using it	Percentage who rate it highest	Grams of protein per $0.08
Powdered skim milk	2	0	22
Fresh cow's milk	58	46	14
Powdered whole milk	26	54	9

VII. Milk consumption in Montero

Interviews with several dairy farmers in Montero revealed that the present consumption of fresh milk approximated 750 liters daily (personal communications, O. Gonzales and H. Hurtado, 1968). "Klim" milk sells approximately 500 pounds weekly, the equivalent of 250 liters daily. "Nido" milk sells approximately 10 percent as much as "Klim", the equivalent of twenty-five liters daily (personal communication, "Klim" Milk Agent, Grace Company, Santa Cruz, 1968)[14]. Adding the quantities, the total daily milk consumption in Montero is approximately 1,000 liters. With 2,700 children under the age of five, this averages to .37 liters daily for each child assuming that all of the milk is drunk by children under the age of five.

[14] We have no figures on "Pil" milk sales in Montero, but in 1964 the company's total production in Bolivia was equivalent to two liters per year for each Bolivian child under the age of five. (UNESCO, 1966).

DISCUSSION

Protein-calorie malnutrition has been shown in many studies to be widespread in the children of the underdeveloped world (Table 12). Our findings in Montero, Bolivia are consistent with the results of previous studies.

Although kwashiorkor, the most serious stage of protein malnutrition, is a clinical diagnosis based on specific clinical criteria (i.e., muscle wasting with retention of subcutaneous fat, edema, growth retardation, psychomotor change), an effective estimate of the general level of protein deficiency in a population can be made by comparing the growth rate of the children with previously determined standards (Jelliffe, 1966).

Growth failure is the first clinical indication of protein deficiency, with low weight for age the principle anthropometric abnormality (Jelliffe, 1966). In our study weight for age was used to estimate the prevalence and

Table 12.

Prevalence of Protein-calorie Deficiency Disease
in Some Less-developed Countries
(Patwardhan, 1964)

Author	Locality	Prevalence (%) in children examined
Jelliffe et al (1960)	Trinidad	1.4
Jelliffe and Jelliffe (1961)	Haiti	9.0
Bengoa (1950)	Venezuela	1.5
Bengoa and Gongora (1960)	Brazil (N.E.)	9.0
Bengoa and Gongora (1960)	Brazil (N.E.)	5.0
Frontali (1961)	Sicily, Italy	4.3
Frontali (1954)	Calabria, Italy	4.0
Dean (1961)	Malaya	6.0
Venkatachalam (1962)	New Guinea	7.5
Nutrition Research Laboratory Indian (1958)	West Bengal (India)	3.2
Someswara Rao et al (1959)	South India	2.7
Dean (1961)	Uganda	3.5
Gongora and Norris (1958)	Uganda	9.6
Munez and Anderson (1962)	Basutoland	2.0
Nicd (1959)	Nigeria	2.7
FAO Africa Survey (1961)	Southern Nigeria	9.0
FAO Africa Survey (1961)	Northern Nigeria	2.0

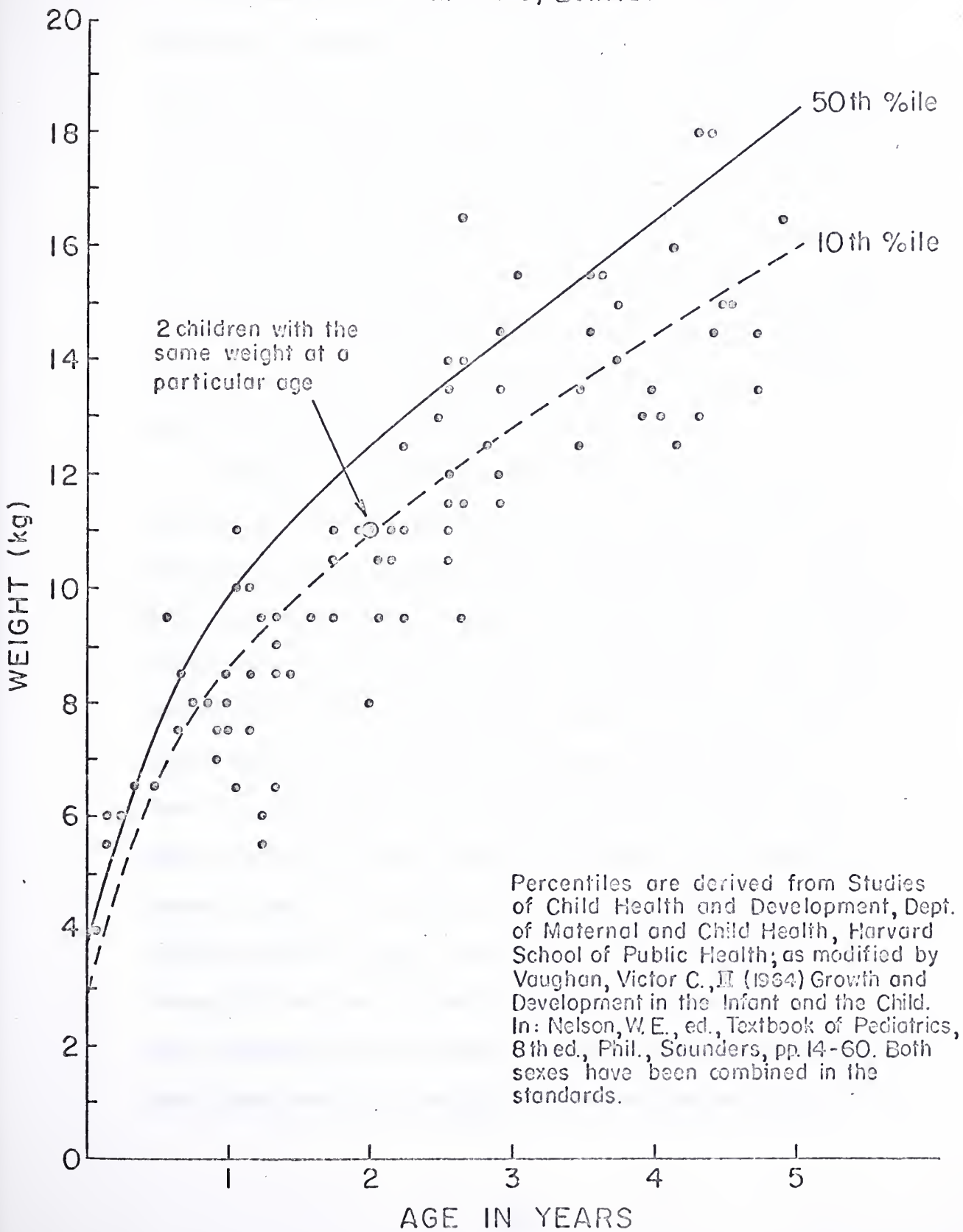
severity of protein malnutrition in Montero, with the Harvard Tables as standards.[15] Although we saw no frank clinical cases of kwashiorkor, 64 percent of the children between one and five years of age were in mild-moderate levels underweight, and 4 percent were severely underweight. Figure 1 shows the position of the children in our study in relation to various percentile ratings of the Harvard Standards. Fifty-five percent of all the children were in the 10th percentile or below. Sixty-eight of the children between twelve and twenty-four months of age were in the 10th percentile or lower.

In addition to its effect on growth, mild-moderate protein deficiency leaves infants and young children especially susceptible to respiratory and gastrointestinal infections, with a mortality from them much higher than in well nourished children (Patwardhan, 1964). At the Montero hospital in 1966 and 1967 the major causes of pre-school child deaths were listed as malnutrition, pneumonia and gastroenteritis. Many of the children had been suffering from all three conditions (Hospital

---

[15] Standards for weight can be most accurate when they have been drawn from the same population which one is studying. But for most underdeveloped countries and regions, including eastern Bolivia, none exist. As substitutes such standards as those derived from the Harvard Longitudinal Studies (Vaughan, 1964) have been widely used. Ford (1964) has collected evidence demonstrating that well-nourished infants and pre-school children of various genetic backgrounds attain weights so close to the Harvard Standards that these standards may be used to assess malnutrition. Jelliffe (1966), in the WHO monograph to be used as a reference in community nutrition surveys, also advocates using the Harvard Standards when local measurements are lacking.

Fig. 1 Scatter graph of weight for age of 87 children between 0 and 5 years whose families were interviewed in the 1968 Survey of Milk Consumption and Attitudes in Montero, Bolivia.



Percentiles are derived from Studies of Child Health and Development, Dept. of Maternal and Child Health, Harvard School of Public Health; as modified by Vaughan, Victor C., II (1964) Growth and Development in the Infant and the Child. In: Nelson, W. E., ed., Textbook of Pediatrics, 8th ed., Phil., Saunders, pp. 14-60. Both sexes have been combined in the standards.

Alfonso Gumicio Reyes, 1966-67).

In Montero the development and severity of protein malnutrition appears to be correlated with the period of breast feeding. It is known that breast milk (in the quantity in which it is usually produced) provides sufficient protein for an infant's needs during the first four to six months of life (Gopalan, 1956; Waterlow, 1960). After that, if it is not supplemented with other protein foods, the deficit between an infant's intake and his requirements increases with each month, the growth rate decreases (Senecal, 1957), and protein malnutrition develops (Jamaica Conference, 1955).

Children in Montero are breast fed for an average of 13 months. But, at five months of age their growth rate (weight-for-age) begins to deviate sharply from the standard. Between twelve and twenty-three months of age, when most of the children have been weaned and are no longer receiving any protein from breast milk, protein malnutrition appears to be most severe (as shown by the percentage of children whose weight was less than 61 percent of the standard weight for their age). This coincides with the findings of Trowell et al (1954) in Uganda, Gomez et al (1954) in Mexico, and Jelliffe and Jelliffe (1960) in Haiti. While the children are being breast-fed they are at least receiving a high quality, easily digested protein food, although not completely fulfilling their requirements. When they stop breast-feeding they are

generally weaned onto the regular family diet, high in bulk but with a low quantity and quality of protein food.

Growth retardation, which becomes noticeable during the second half of the first year of life, continues for the entire pre-school period up to fifty-nine months of age. After the second year of life it continues at an almost steady level, and we can surmise that by this time the body has adjusted to the inadequate protein intake with stunted physical development, including decreased rate of bone growth (Acheson, 1960). Downs (1964) called this "nutritional dwarfing", attributing it to early protein malnutrition.

In Montero the pre-school child's inadequate protein consumption is not due for the most part to his mother's ignorance. The mothers manifest a general awareness of the importance of certain foods for children, 70 percent feeling that milk is needed by children at least until the age of three, and 68 percent feeling that milk is the most important food for children at weaning time. This awareness contrasts sharply with the findings of Dean in Uganda (Burgess and Dean, 1962). Although a high bulk, low protein diet for weaning children was common to both places, in Uganda it was not recognized by the mothers that young children have special food needs. The awareness of the mothers in Montero can be attributed to the fact that exposure there to medical and public health personnel has been quite extensive during the past several years. Although

the mothers are mostly illiterate, there have been attempts to teach basic nutrition to them in special classes as well as during regular clinic visits.

Although the mothers in Montero know about the importance of milk, few of them seem to feel that it is of sufficient immediate importance for them to make sacrifices in order to insure that their pre-school children receive this food regularly. Rather, they feed them the ordinary "comida de la familia" after weaning, excusing themselves for not purchasing milk by saying that they are poor.

Although there are several high quality protein foods available in Montero, the income of a poor family does not permit it to buy enough of these foods to satisfy its protein requirements completely from them. However, adults and older children, with their greater capacity to eat and proportionately decreased protein needs, can satisfy their needs from a diet of mainly lower quality protein foods, primarily rice. But, pre - school children, especially under the age of three, have a difficult time doing so, because their appetites are usually not great enough to permit them to consume a quantity of such food sufficient to provide the protein they need (FAO/WHO Expert Group, 1965).

Milk is the most widely recognized, highly regarded protein food for children in Montero. Its use until the present time has been limited primarily by income, but also by attitudes. Of the

different types of milk available, most mothers would prefer to buy and are presently buying inadequate quantities of the expensive milks, rather than more adequate quantities of a cheaper milk which supplies the same protein.

There are several possible reasons for the relative frequencies in which the various types of milk are consumed and the opinion in which each is held by the people of Montero. Fresh cow's milk which is used most frequently has the lowest price per unit, selling for $0.12 per bottle (24 ounces). The smallest size unit of powdered whole milk one can buy, a half pound can, costs $0.44. Powdered skim milk is sold only in 1 kilogram bags for $0.96. Thus, with a small sum of money it is easiest to buy a bottle of fresh milk. Fresh milk is also considered the most "natural" form of milk, and is the simplest to serve. Powdered whole milk, valued highest by a majority of the people, is marketed by subsidiaries of two American corporations, the Nestle Corporation and the Borden Corporation. These milks (whose brand names are Nido and Klim) come attractively packaged in metal vacuum cans and are sold in many stores throughout Montero. They are advertised as being safest, purest and most healthful, and are recommended by doctors in town. Powdered skim milk (Pil), valued lowest and used by almost no one, is manufactured in Bolivia by a subsidiary of the Bolivian government. It is not advertised, is packaged in plain plastic bags with small labels, and sold

only in a few stores in town. It also mixes slowly and somewhat unevenly with water, making it inconvenient to serve.

After powdered skim milk, beef is the cheapest source of protein. It is a highly regarded food and is readily available in Montero. But, unlike milk which is considered primarily a food for small children, beef is coveted by the whole family, especially the adults. Thus, to satisfy the protein requirements of a pre-school child with meat, and also satisfy the other members of the family would require more money than is available. Eggs are another source of protein, but they are most expensive.

In addition to milk and the other protein foods mentioned above, there are also several special protein supplement products being distributed in Montero through welfare programs. The Catholic church distributes powdered skim milk to about thirty families, each receiving enough powder to make 4 liters of milk weekly. This is supplied by the United States Food For Peace program. The church also distributes MPF, a high - protein soya flour product, to thirty families. During the past year the Consejo de Salud Publica of Montero has been providing more than one hundred families with regular rations of CSM, a corn-soya-milk mixture.[16]

---

[16] CSM and MPF are examples of a new class of vegetable protein foods developed since the 1950's after the importance of protein supplementation of protein-deficient diets was fully realized (Scrimshaw and Bressani, 1961; Bressani and Behar, 1964). Appendix II lists a wide variety of protein food mixtures, most of which are currently being used in child-feeding programs. But their production and use is still quite limited.

These protein supplements are very beneficial to those receiving them, but they are not affecting a majority of the approximately 2,200 children in Montero between the ages of one and five. They are also not integrated into the commercial marketing structure of the community, and are essentially being given away when available.

Milk, mainly in the form of skim milk powder has been the most important protein supplement for pre-school children (Tepley, 1965). It has also been the treatment of choice in rehabilitating children with kwashiorkor (Trowell, Davis and Dean, 1954; Behar et al, 1958; Gomez et al, 1955; Wharton et al, 1968). Largely due to the influence of UNICEF/WHO/FAO programs, during the past twenty years milk consumption and local production have been greatly stimulated in many developing countries including Bolivia (UNESCO, 1966).

The potential for using milk to alleviate protein malnutrition in Montero appears considerable. Milk is universally known, although not regularly used by poor families there; it is the most highly regarded food for pre-school children, and is associated with good health. These are all important pre-requisites for a product which one hopes to introduce on a mass scale (Graham, 1965; Mckenzie and Yudkin, 1964). However, these attributes of milk in general, are not associated to the same extent with the different available types of milk. Whole powdered milk which is most highly regarded is also most expensive,

as a result of being imported from foreign countries. It could not become a regular diet item for poor families unless its price were heavily subsidized by the Bolivian government, an unlikely event considering Bolivia's low foreign currency reserves. Fresh cow's milk is also highly regarded, but its availability varies greatly from season to season depending upon how the rainfall affects the cows' pasturage. Since it is not pasteurized and is subject to bacterial contamination, it turns sour within hours in the warm tropical climate. Powdered skim milk is cheap enough to be used daily, but currently lacks the popularity of the other products. To be accepted on a mass scale it would have to be produced more carefully, marketed more effectively and made more widely available in greater quantities.

At present all the powdered skim milk produced in Bolivia comes from one government plant in the city of Cochabamba, 300 miles from Montero. It is not nearly adequate for the needs of the country. In 1964 the total production of Pil (the Bolivian powdered skim milk) was 137,000 kilograms, equivalent to 2 liters per year for each Bolivian child under age five (UNESCO, 1966). However, there are indications that milk production in the Montero region will significantly increase during the next few years. Until 1968 there were no milk pasteurizing facilities in the entire state of Santa Cruz. This year two commercial pasteurizing and processing plants are beginning operations in

the city of Santa Cruz, thirty-five miles from Montero, and there are plans for an agency in Montero to collect and distribute milk. This will provide a stimulus to dairy farming and may result in larger quantities of milk on the market at lower prices. Whether increased quantities of milk at a lower price do actually become available will depend partially on whether or not the rising demand for dairy products in the middle and upper classes will absorb by itself the increased production. If there were a sufficiently large surplus of fresh milk during the high production season, it could be processed into powdered skim milk to be sold year-round at low prices. The popularity of the powdered skim milk would then depend on how well it were produced, marketed, advertised and, very significantly, on how much support were given to it by the medical and public health personnel in town.

SUMMARY

The prevalence of protein malnutrition in the pre-school child population and the potential for using milk to alleviate it were studied in Montero, Bolivia.

Protein malnutrition is widespread amongst pre-school children of the Spanish-speaking poor families in Montero. Its onset coincides with the age when breast milk no longer completely fulfills the growing infant's protein requirement. It is most widespread and severe during the second year of life when most of the children are weaned. Although most mothers are aware of the importance of certain high protein foods (particularly milk) for their pre-school children, they do not feed them to the children regularly. Few children continue drinking milk regularly after being weaned, even though their mothers feel it is the most important food for them. After weaning most of the children begin eating the family diet, which is low in protein, and they do not receive special supplementation. There are a number of high protein

foods readily available in Montero, including milk, meat and eggs, but they are very expensive in relation to the income of a poor family, and are eaten in small quantity. Powdered skim milk is the cheapest source of protein, but it is bought by very few people. A majority of the mothers prefer powdered whole milk for their children, even though its price is two and one half times that of skim milk.

These results indicate that a low-priced milk, if it were prepared and marketed properly, with the aid of the medical personnel in Montero, would be well-accepted and could be used to alleviate protein malnutrition in the pre-school children there.

Appendices

APPENDIX I.

Protein quality may be described in terms of Net Protein Utilization (NPU). This represents the proportion of ingested nitrogen (N) which is retained in the body. It thus takes into account the quality of a protein's amino acid mixture as well as the digestibility of the protein:

$$NPU = N \text{ retained} / N \text{ ingested}$$

The NPU of reference protein (hen's egg) is 100 by definition. The NPU of a dietary protein is determined by nitrogen balance experiments in which the protein is fed at a level below the maintenance level, and after a correction has been made for the nitrogen excreted on a protein-free diet. It has been estimated that the dietary protein in diets of well-developed countries has an NPU value approximately 70-80. In developing countries amongst the poor class, NPU = 60-70 can be used as an approximation of the quality of the dietary protein.

Table A. (page 48) shows the protein requirements of children and adults in terms of reference protein and lower quality protein diets. In each case the protein requirement listed is 20 percent higher than the average estimated need. This excess above the average will provide sufficient protein for 97.5 percent of the people in any age group, as compared with 50 percent which the average group would include.

An additional allowance of 10 percent is made as adjustment for wastage of edible food between purchase and consumption. Thus, the protein requirements in Table A. have to be multiplied by a factor of 1.1 in order to adjust them for comparison with food intakes in food consumption tables, which are expressed in terms of food which must be purchased, and already have been corrected to include the 10 percent wastage between purchase and consumption. A child in the 1-3 year age group eating a diet whose protein has an average NPU of 65 would require 1.65 grams (extrapolated from Table A.) times 1.1, or a total of 1.82 grams of protein per kilogram of body weight per day.

Table B. (page 49) contains the NPU values for a large number of foods. When the protein intake from low protein diets is insufficient, it is erroneous to assume that this can be corrected merely by an increased consumption of the same foods. Children below the age of three who are on a diet in which the protein has an average NPU value less than 60 cannot eat enough

of that food to satisfy their protein requirement simply because their appetites are not great enough. Some additional source of high quality protein is needed if they are to realize their full growth potential (FAO, 1965).

Table A.

Protein Requirements of Children and Adults and the Effect of Protein Quality
(FAO, 1965)

Age	Grams of Protein per kilogram body weight per day					
	NPU 100	NPU 90	NPU 80	NPU 70	NPU 60	NPU 50
Infants (months)						
0-3	2.3					
3-6	1.8					
6-9	1.5					
9-12	1.2					
Children (years)						
1-3	1.06	1.18	1.32	1.50	1.75	2.11
4-6	0.97	1.08	1.21	1.39	1.61	1.94
7-9	0.92	1.03	1.15	1.32	1.54	1.85
10-12	0.86	0.96	1.08	1.24	1.44	1.73
Adolescents						
13-15	0.84	0.94	1.06	1.20	1.39	1.68
16-19	0.77	0.85	0.96	1.10	1.27	1.54
Adults	0.71	0.79	0.89	1.01	1.18	1.42

Table B.

Protein Percentage and NPU Values of Selected Protein Foods

Food	NPU	Protein (percentage)
Milk (cow's)	75	3.5
Egg (hen's)	100	12.8
Casein	72	
Egg albumin	83	
Beef muscle	80	18.5
Beef heart	67	
Beef liver	65	
Beef kidney	77	
Pork tenderloin	84	15.5
Fish	83	18.8
Rice (milled)	57	7.6
Corn meal	55	9.2
Millet	56	6.2
White flour	52	10.5
Skim milk, dried		36.0
Whole milk, dried		26.0
Groundnut flour	48	51.2
Soy flour	56	42.8
Sesame seed	56	17.6
Sunflower seed	65	22.4
Cottonseed meal	66	32.9
Potato	71	2.0
Navy bean	47	22.1
Peas	44	23.8
Sweet potato	72	1.8
Cassava (yuca)	--	0.9

Appendix II

New Vegetable Protein Food Mixtures
(Kapsiotis, G.D., 1967)

Product	Country	Composition	Protein Content %
1. INCAPARINA	Guatemala	Maize, cotton seed flour, Vitamin A, lysine, $CaCO_3$	27.5
	Colombia	Same plus de-fatted soya flour	27.5
	Mexico	Same plus de-fatted soya flour but without cotton flour	30.0
2. FORTIFEX	Brazil	Maize, de-fatted soya flour, Vitamin A, B_1, B_2, dl-methionine, $CaCO_3$	30.0
3. PERUVITA	Peru	Quinua and cotton seed flour, skim milk powder, sugar, spices, $CaCO_3$, Vitamins A, B_1, B_2	30.0
4. PRONUTRO	South Africa	Maize, skim milk powder, peanut, soya, fish protein concentrate (FPC), yeast, wheat germ, Vitamin A, B_1, B_2, niacin, sugar, iodized salt	22.0
5. SARIDELE	Indonesia	Extract of dry soya, peanut oil, Vitamin A, B_1, B_{12}, C, sugar, $CaCO_3$ Flavoring	42.0
6. ARLAC	Nigeria	Peanut flour, skim milk powder, salts, Vitamin B_1 B_2, B_{12}, D.	42.0
7. INDIAN MPF	India	Peanut flour, chichpea flour, $CaCO_3$, Vitamin A, B_1,B_2.	40.0

8. FAP	Morocco	Fish protein concentrate (FPC)	80.0
9. ALIMENT DE SEVRAGE	Algeria	Wheat, chick peas, lentils, skim milk powder, sugar, Vitamin D	20.0
10. ALIMENT DE SEVRAGE	Senegal	Millet flour, peanut flour, skim milk powder, sugar, Vitamin A, D, Calcium	20.0
11. CSM	United States	Maize (pre-cooked), de-fatted soya flour, skim milk powder, $CaCO_3$ Vitamins	20.0
12. SUPRO	East Africa	Maize or barley flour, torula yeast, skim milk powder, salt, condiments	24.0

Call Back

1968 Survey of Milk Consumption and Attitudes in Montero, Bolivia

Block No.____
Eligible House No.____

Refused

Good morning (afternoon)

Unable - are you the mother of the little children in the house? Yes____ no____ Who are you?_____

F)- Who always watches the children?_____
- When is she going to return?_____

- Madam, do you have a small child in the house, 1 or 2 years old, who has not yet reached his 3rd birthday? Yes____ No____

Time begun - Is the child yours, madam? Yes____ No____

- In this house, the floor is of dirt? Yes____ No____

M'am, I have come to learn about the life of the people here. I would like very much to ask you some questions. Your answers will be of great help in my studies.

Total time

Very good, m'am. May we sit down to chat?

Basic data on the house:
- palm roof_____
- walls of palm or mud_____
- floor of dirt_____
- no electricity_____
- speak Spanish_____
- no potable water (from faucet) in the house_____

What follows is only for the mother or other woman who cares for the children:

1) Does the grandmother live here? Yes____ No____
2) Who supports the family in this house?_____
3) M'am, up to what grade did you go in school?_____
4) Where were you born?_____
5) What are the ages of all the children who live in this house? ___ ___ ___ ___ ___ ___ ___ ___ ___
   a) all the children are yours? Yes____ No____

6) What adults live in the house? _____ _____
_____ _____
7) How many persons in this house are working? _____
8) Which is the best food for children?_____ DK____
a) Why?_____ DK_____
9) Who drinks milk in this family?_____
10) What type of milk do your children drink? _____
a) are you using powdered milk also? Yes____ No____
11) Which child drinks the most milk in the family?_____
a) How much does he drink each day?_____
b) How many teaspoons do you use to prepare each cup (for powder)? _____
12) Which of the children do not drink milk?_____
All drink_____ None drinks_____
13) When did you buy milk the last time?_____
14) When are you going to buy milk the next time?_____
15) How much does this milk cost?_____
16) How much milk do you buy each time?_____
17) Do you receive milk from some other source also?
Yes_____ No____
18) M'am, how did you learn about milk?_____ DK_____
19) Since what year are you buying milk for your children?
0-1 year____ 1+-3 years____ 3+-5years _____ 5+ years____
20) Which person who you know, knows most about nutrition for children? _____
21) Did you (or your daughter) give breast milk to your (her) last child? (the child previous to the one nursing now) Yes____ No____
a) For how long? less than 6 months?_____ 6-9 months?____
9months - 1year____ 1-1.5 years_____ 1.5-2 years_____
over 2 years_____
b) Why did you stop? _____ DK_____
22) Do you give your child cow's milk, in the same week as your breast milk? Yes_____ No_____ Why not?_____
a) Do you give your child powdered milk, in the same week as your breast milk? Yes____ No___ Why not?____
23) Until what age do your children need milk, in whatever form? 0-1 year_____ 1-3 years_____ 3-5 years____
5+ years _____ DK_____
24) If you had enough money to buy everything that you wanted, how much milk would you buy?_____
25) What types of foods does a 2 year old child need?
milk mentioned_____ milk not mentioned_____
(if milk not mentioned)
breast milk_____ another type of milk also____
26) Does a 3 year old need milk? Yes_____ No_____
how much?_____

27) Which is the best food for your small children at the time you are weaning them? _____ DK_____
28) Until what age is it good to give breast milk to a child _____ DK_____
29) Which is the best milk that one can buy?_____ DK____
30) Why is milk a good food for small children?_____ DK_____
    a) who taught you about milk?_____ DK_____
31) How much money did you use to buy food last week? less than $b.50_____ $b.50-74____ $b.75-100____ $b.100+_____ DK_____
32) M'am, your husband (or your daughter's husband) supports the family? Yes____ NO _____
    a) How much does the head of the family earn each week? less than $b.50____ $b.50-74_____ $b.74-100_____ $b.100+ _____ DK_____
33) Which months did the head of the family not work during the last year? _____ _____ _____ DK__
34) What work does the head of the family do?_____
35) M'am, do you (or the children's mother) work? Yes__ NO__
    a) What work do you (she) do?_____
    b) How much money do you (she) earn weekly? less than $b.50_____ $b.50-74_____ $b.75-100_____ $b.100+_____ DK_____

A) Do you have any milk in the house now? Yes____ No____
B) What is "Pil" milk? Knows____ Does not know_____
C) Did any of your children die? Yes__ How many____ No_____
   a) when?_____
D) How old was each one? _____ _____ _____
E) What foods did you give your children when you were weaning them?** _____
F) (see page 1 near top)

** Questions A-E were asked only at certain interviews. They are noted in Table

Time ended_____

____ Evidence of possible bias because:

Comments:

DK means Does not Know ($b. means pesos bolivianos; $b.1 is 8¢)

Call Back

1968 Survey of Milk Consumption and Attitudes in Montero, Bolivia

Block No.____
Eligible House No.____

Refused

Buenos dias (tardes) Señora.

Unable

-Es Ud. la madre de los ninos pequeños en la casa? Si_____ No_____ Quien es Ud.?_____
-Quien siempre cuida los ninos?_____
-Cuando ella va regresar?_____

Time begun

-Señora, tiene en la case un nino pequenito, que tiene 1 O 2 años de edad, y todavia no ha cumplido 3 anos? Si_____ No_____
-El nino es suyo, señora? Si_____ No_____ _____
-En esta casa, el piso es de tierra _____ o No_____?

Señora, yo he venido para aprender acerca de la vida de la gente aqui. Me gustaria mucho hacerle algunas preguntas. Sus respuestos seran de gran ayuda en mis estudios.

Bueno, señora. Es posible que podemos sentarnos para charlar?

Total time

Datos basicos de la casa:
-techo de motocu_____
-paredes de motocu o barro_____
-piso de tierra_____
-no hay electricidad_____
-habla castellano_____
-no hay agua potable en la casa_____

What follows is only for mother or other woman who cares for the children.

1) Vive la abuela aqui? Si____ No____
2) Quien mantiene la familia en esta casa?_____
3) Ud. señora, hasta que curso ha ido a la escuela_____
4) Donde nacio Ud.?_____
5) Cuantos años tiene cada uno de los niños que viven en la casa?____ _____ _____ _____ _____ _____ _____ _____
   a) todos los niños son suyos? Si_____ No_____
6) Que mayores de edad viven en la casa? ____ _____ ____ _____
7) Cuantas personas en esta casa estan trabajando?_____

8) Cual es el mejor alimento para los niños? _____ NS_____
   a) Porque?_____ NS_____
9) Quien toma leche en esta familia? ____ ____ ____ _____ ___
10) Que clase de leche toman sus niños? _____
   a) Esta usando leche en polvo tambien? Si_____ No_____
11) Quien es el niño que toma mas leche en la familia_____
   a) Cuanto toma cada dia ?_____
   b) Cuantas cucharillas usa Ud. para preparar cada taza?___
12) Cual de los niños no tomala leche___ __ __ __ __ __ __
   todo toman_____ todo no toman_____
13) Cuando compro Ud. la ultima vez leche? _____
14) Cuando va a comprar leche la proxima vez?_____
15) Cuanto cuesta esta leche?_____
16) Cuanta leche compra Ud. cada vez? _____
17) Recibe leche de algun otro lado tambien? _____ No___
18) Señora, como Ud. ha aprendido acerca de la leche _____NS__
19) Desde que año esta Ud. comprando la leche para los niños?
   0-1anos___ 1-3 anos___ 3-5 anos___ 5+ anos____
20) Que persona que Ud. conoce, sabe mas, acerca de la alimentacion
   de los niños?_____
21) Ha dado Ud. (o su hija) leche de pecho a su ultimo niño?
   (el niño antes del que toma el pecho ahora) Si___ No____
   a) por cuanto tiempo? menos de 6 meses____ 6-9 meses____
      9 meses-1 anos____ 1-1.5 años____ 1.5-2 años____ 2+ años____
   b) Porque dejo?_____ NS_____
22) Da Ud. a su niño, leche de vaca, en la misma semana, con su
   leche de pecho? Si___ No___ Porque no?_____
   a) Da Ud. a su niño, leche en polvo, en la misma semana, con
      su leche de pecho? Si_____ No____ Porque no?____
23) Hasta que edad necesitan sus niños la leche, en cualquier
   forma? 0-1 año___ 1-3 años___ 3-5 años____ 5+ años____ NS___
24) Si Ud. tuviera plata suficiente, para comprar todo lo que
   quiere, entonces, cuanta leche compraria? _____
25) Que clase de alimentos necesita un niño de 2 años?_____
   milk mentioned_____ milk not mentioned_____
   (if milk not mentioned)
   leche de pecho_____ otro tipo de leche tambien_____
26) Necesita leche un niño de 3 años? ono____ Cuanto?_____
27) Cual es el mejor alimento para sus niños pequeños.
   en tiempo de destetarse? _____ NS_____
28) Hasta que edad es bueno dar la leche de pecho a un niño?_____
   NS_____
29) Cual es la mejor leche que se puede comprar?_____ NS_____
30) Porque es la leche un buen alimento para los niños pequeños?
   _____ NS_____
   a) Quien le ha enseñado acerca de la leche?_____ NS_____
31) Cuanta plata ha usado Ud. para comprar comida en la semana
   pasada? $b._____ menos de $b.50____ $b.50-74____ $b.75-100___
   mas que 100_____

32) Señora, su esposo (o el esposo de su hija) mantiene la familia? Si___ No____
   a) cuanto gana el jefe de la familia cada semana? $b.____
      menos de $b.50____ $b.50-74____ $b.75-100_____$b.100+____
      NS_____
33) Que meses no ha trabajado el jefe de la familia durante el año pasado?_____
34) Que trabajo hace el jefe de la familia?_____
35) Señora, trabaja Ud. (o la madre de los niños)? Si___ NO__
   a) Que trabajo hace Ud. (ella)? _____
   B) Cuanta plata gana Ud. (ella) cada semana? $b._____
      menos de $b.50___ $b.50-74___ $b.75-100___ $b.100+____
      NS _____

Time Ended_____

_____ Evidence of possible bias because:

Comments:

NS no sabe $b. pesos bolivianos

Reminder to Appear at the Hospital

BLOCK #_____

HOUSE #_____

SEÑORA:

POR FAVOR VENGA AL HOSPITAL CON TODOS SUS NIÑOS, ESTE SABADO _____ A LAS NUEVE DE LA MAÑANA PARA PESAR LOS NINOS!!

(Translation)

BLOCK #_____

HOUSE #_____

MADAM:

PLEASE COME TO THE HOSPITAL WITH ALL OF YOUR CHILDREN THIS SAIURDAY _____ AT NINE IN THE MORNING TO WEIGH THE CHILDREN!!

Appendix IIIa. and IIIb.

Compilation of Data Obtained in Answer to Questions in Appendix III.

Appendix IIIa. (Families 1-25)

Question / Family	(1)	(2)	(3)	(5)	(5a)
1)	+	M,GM	3	1^{o},7,15,19	-
2)	+	F	3	7m,2^{11},6,10,12	+
3)	+	GF	2	1^{4},3^{6},5,6	-
4)	-	F	3	1^{3},3^{1}	+
5)	-	F	2	1^{1},2^{8},5,8,12,13	+
6)	-	F	0	1^{10},8	-
7)	+	F	3	2m,2^{1}	+
8)	+	F	2	2^{8},4^{2},5^{8}	+
9)	-	F	5	1^{9},5	+
10)	+	GF	4	1^{o},5,8,9,13,15	+
11)	+	U	1	1^{3},3^{6},6,7,11	+
12)	-	F	3	2m,2^{10},4^{9},7,8,11	+
13)	+	U	1	2^{1},5^{5},11/3^{9},5^{2},7^{5},11,14	-
14)	+	F	3	9m,2^{7},5^{1},6^{1},7^{8}	+
15)	-	F	0	1^{11},4^{2}	+
16)	+	F	3	2^{o},3^{11},9,11,12	+
17)	-	F	3	8m,2^{2}	+
18)	-	F	1	1^{7},3^{6},9,14,16,17	+
19)	-	F	2	1^{9},5^{3},7,12,14	+
20)	+	F	0	1^{2},3^{7},7,10,13	+
21)	-	F	3	11m,2^{11},5,7,11	+
22)	-	M	0	1^{9},4^{5},7/7,9,13,15	-
23)	+	F	4	1^{11},10,12,15,16	+
24)	-	F	2	2^{7},3^{8},7,10,11,17,18,20	_
25)	-	F	0	2^{8},3^{9},4^{6},7,9,13,16	+

+ yes
- no

S=son
F=father
A=aunt
M=mother

GM=grandmother
GF=grandfather
U=uncle

Question	(6)	(7)	(8)	(8a)
Family				
1)	M,GM	2	L	DK
2)	F,M,GM	1	L	DK
3)	M,GF,GM	1	rice	we always make it
4)	F,M	2	soup	DK
5)	F,M	1	green veg.	nourishes
6)	F,M	2	DK	-
7)	F,M,GM	2	L	vitamins
8)	F,M,GM	2	egg	vitamins
9)	F,M	1	L	healthful
10)	M,GF,GM	3	L	pure
11)	M,GM,U,U,A,Fr	3	green veg.	vitamins
12)	F,M	1	L	DK
13)	M,M,GM,U	2	DK	-
14)	F,M,A,GM	2	L	vitamins
15)	F,M	1	soup	has green veg.
16)	F,M,GM,U,U	5	meat	necessary to live
17)	F,M	1	L	DK
18)	F,M	2	meat	DK
19)	F,M	2	L	DK
20)	F,M	1	L	vitamins
21)	F,M,GF	2	tomato	vitamins
22)	M	1	egg	DK
23)	F,M,GM,S	4	meat	energy
24)	F,M,S.	3	L	DK
25)	F,M	1	L	healthful

M=mother
GM=grandmother
F=father
GF=grandfather
U=uncle
A=aunt
Fr.=friend
S=son
L=milk
DK=don't know

Question	(9)	(10)	(10a)	(11)	(11a)	(11b)	(12)
Family							
1)	1^{o},7,GM	K	+	7	3C	1½	15
2)	2^{11}	V	-	2^{11}	1B	-	6,10,12
3)	0	X	X	X	X	X	-
4)	0	X	X	X	X	X	-
5)	0	X	X	X	X	X	-
6)	1^{10}	N	+	1^{10}	3C	3	8
7)	2m,2^{1}	V	+	2^{1}	1B	4	+
8)	2^{8},4^{2},5^{8},F,M	K	+	2^{8}	4C	6	+
9)	1^{9}	V	-	1^{9}	3C	-	5
10)	1^{o},8,9	V	-	9	-	-	5
11)	1^{3},3^{6}	V	-	3^{6}	-	-	+
12)	2m,2^{10},4^{9},7,8,11	V	+	2^{10}	2C	2	+
13)	0	X	X	X	X	X	-
14)	9m	K	+	9m	1L	3	+
15)	1^{11}	N	+	1^{11}	2C	6	4^{2}
16)	2^{o},3^{11},9	V	-	2^{o}	2C	-	+
17)	8m,2^{2}	V	+	2^{2}	1B	2	+
18)	1^{7},3^{6}	K	+	3^{6}	½B	4	14,16,17
19)	0	X	X	X	X	X	-
20)	1^{2},3^{7}	Po	+	3^{7}	2½C	1	7,10,13
21)	0	X	X	X	X	X	-
22)	0	X	X	X	X	X	-
23)	1^{11},10	V	-	1^{11}	1B	-	12,15,16
24)	2^{7},3^{8},7	V	+	2^{7}	2C	-	10,11,17,18,20
25)	2^{8},3^{9},4^{6},7	K	+	2^{8}	1C	3	9,13,16

M=mother
F=father
GM=grandmother
K=Klim
V=fresh cow
N=Nido
Po=powder
X=not applicable
PS=powder skim
L=liter
+ yes
- no
C=cup
B=bottle
DK=don't know

Question	(13)	(14)	(16)	(17)	(19)	(20)
Family						
1)	tdy	4d	½P	nuns	0-1	neighbor
2)	8d	DK	1B	no	1-3	DK
3)	DK	DK	-	no	0	DK
4)	1m	DK	1B	no	2	DK
5)	DK	1wk	½P	school	0-1	sister-in-law
6)	12d	3d	2P	no	1-3	DK
7)	1d	1d	1B	no	1-3	DK
8)	2wk	1wk	5P	no	5+	neighbor
9)	1d	1d	1B	no	1m	DK
10)	4d	DK	1L	no	5+	my mother
11)	5d	2d	1B	no	2	sister-in-law
12)	DK	3d	2B	no	8	neighbor
13)	3m	DK	3B	no	7	DK
14)	5d	tdy	½P	CSM	6	doctor
15)	4d	3d	1P	no	6m	doctor
16)	1d	1d	2B	no	1	doctor
17)	1d	1d	1B	no	1½	neighbor
18)	5d	2wk	1P	no	2	husband
19)	6m	DK	-	no	5	DK
20)	1m	1d	½P	no	8	a woman
21)	N	DK	-	no	0	DK
22)	N	DK	-	no	0	patroness
23)	1wk	3d	1B	no	5+	peace corps
24)	1m	DK	1B	school	3	DK
25)	1d	4d	1P	no	15	DK

tdy-today
d=day
m=month
wk=week

N=never
DK=don't know
P=pound
B=bottle

L-liter
CSM=distribution program

Question	(21)	(21a)	(23)	(24)	(25)	(26)	(26a)
Family							
1)	+	9-12m	15	1B/d	+	+	2B/d
2)	+	14	1-3	1P/wk	+	+	1B/d
3)	+	14	1-3	0	-	-	X
4)	+	12	1^6	2B/d	+	-	X
5)	-	X	1-3	DK	+	+	DK
6)	+	6	5+	2P/m	-	-	X
7)	+	9	4	2P/wk	+	+	1B/d
8)	+	9	10	1½B/d	+	+	2C/d
9)	+	15	3-5	2L/d	+	-	X
10)	+	13	5+	1L/d	+	+	3C/d
11)	+	14	5+	2B/d	+	+	4C/d
12)	+	14	3-5	3B/d	+	+	2B/d
13)	+	18	4	3B/d	+	-	X
14)	+	5	1^6	2B/d	+	+	1C/d
15)	+	15	2	2P/wk	+	+	DK
16)	+	18	5+	4B/d	+	+	DK
17)	+	12	3^o	1B/d	+	+	2B/d
18)	+	19	5^o	2B/d	+	+	2B/d
19)	+	14	5+	1L/d	+	+	1B/d
20)	+	10	2^o	1P/wk	-	-	X
21)	+	11	1^o	2L/d	-	-	X
22)	+	18	1^6	2B/d	+	+	DK
23)	+	12	20	5B/d	+	+	5C/d
24)	+	18	4^o	3B/d	+	+	1C/d
25)	+	3	4^o	1P/wk	-	-	X

+ yes — L=liter

- no — P=pound

m=month — d=day

B=bottle — wk=week

Question	(27)	(28)	(29)	(30)
Family				
1)	L	12	V	DK
2)	L	14	K	strengthens bones
3)	meat juice	14	V	has fat
4)	L	18	V	DK
5)	L	18	K	grow more quickly
6)	L	6	N	they grow
7)	L	14	K	DK
8)	L	10	V	vitamins
9)	L	10	K	vitamins
10)	L	DK	V	develops child
11)	tomato	10	K	vitamins
12)	oatmeal	12	V	DK
13)	L	18	K	nourishes
14)	juice	9	K	vitamins
15)	juice	18	N	vitamins
16)	L	12	V	DK
17)	L	16	V	DK
18)	L	12	K	DK
19)	soup	15	V	DK
20)	L	12	N	healthful
21)	juice	9	K	DK
22)	DK	18	V	DK
23)	L	8	V	maintains them
24)	L	12	K	nourishes
25)	oatmeal	9	V	nourishing

L=milk
units=months
d=days

V=fresh cow
K=Klim
N=Nido

Question	(30a)	(31)	(32)	(32a)	(33)
Family					
1)	my mother	$b56	-	$b30	DK
2)	D	70	+	70	D,Ja
3)	myself	DK	-	250	0
4)	no noe	30	+	60	DK
5)	D	70	+	DK	Mar,Ap
6)	D	72	+	90	DK
7)	myself	40	+	30	Ja,Ma
8)	radio	60	+	120	0
9)	my mother	75	+	200	0
10)	D	70	-	60	0
11)	D	70	-	70	0
12)	my mother	70	+	120	12
13)	DK	65	-	30	0
14)	D	110	+	95	Oc-Dec
15)	a woman	80	+	90	0
16)	D	100	+	DK	0
17)	school	65	+	72	N,D
18)	my husband	60	+	60	0
19)	patroness	DK	+	60	J
20)	patroness	45	+	72	N-Ja
21)	D	30	+	50	Ja,F
22)	patroness	DK	-	22	DK
23)	friends	140	+	55	0
24)	D	100	+	90	0
25)	myself	40	+	120	0

D=doctor
+ yes
-no

0=none
Ja=January
F=February
Mar=March

Ap=April
Ma=May
J=June
Ju=July

Oc=October
N=November
D=December

Question	(34)	(35a)
Family		
1)	makes rice bread	servant
2)	AL	0
3)	AL	0
4)	AL	washerwoman
5)	farmer	makes chicha, bread
6)	housebuilder	vendor in market
7)	chauffer	washerwoman
8)	technician (Guab)	seamstress
9)	chauffer	0
10)	sells fruit	0
11)	truck assistant	cook
12)	housebuilder	0
13)	AL	0
14)	tekegraph operator	seamstress
15)	brick maker	0
16)	AL	makes cans
17)	AL	vendor in market
18)	AL	washerwoman
19)	street vendor	vendor in market
20)	AL	0
21)	AL	washerwoman
22)	cook	cook
23)	gardner	0
24)	AL	0
25)	brickmaker	0

AL=agricultural laborer 0=none

Question	(35b)	(A)	(B)	(C)	(D)
Family					
1)	25	X	X	X	X
2)	0	X	X	X	X
3)	0	X	X	X	X
4)	48	X	-	X	X
5)	20	X	-	1	1^{8}
6)	30	X	X	X	X
7)	12	X	X	X	X
8)	30	-	X	X	X
9)	0	-	X	X	X
10)	0	-	X	X	X
11)	15	-	+	0	X
12)	0	+	X	X	X
13)	0	-	X	3	$8d,9d,1^{6}$
14)	30	-	X	X	X
15)	0	+	-	X	X
16)	20	-	X	X	X
17)	30	-	X	X	X
18)	20	-	X	X	X
19)	25	-	-	3	$8m,1^{3},1^{7}$
20)	0	-	X	X	X
21)	30	-	-	2	DK
22)	22	-	-	1	7
23)	0	-	-	3	7d,7m,7y
24)	0	-	-	5	$2m,3m,9m,1,1^{1}$
25)	0	-	-	2	3m,4m

+ knows

- does not know

X not asked

Question	(E)	(F)
Family		
1)	X	GM
2)	X	M
3)	X	M
4)	soup with rice	M
5)	soup with noodles, greens	M
6)	X	M
7)	X	M
8)	X	M
9)	X	M
10)	X	M
11)	carrot,potato,noodle,milk	M
12)	X	M
13)	X	M
14)	X	M
15)	vegetable soup, fruit	M
16)	X	M
17)	X	M
18)	X	M
19)	X	daughter
20)	X	M
21)	noodle soup, wheat, corn starch, milk	M
22)	vegetable soup	M
23)	X	M
24)	X	M
25)	milk, soup, cornstarch, oatmeal	M

Appendix IIIb. (Families 26-50)

Question / Family	(1)	(2)	(3)	(5)	(5a)
26)	+	M	4	2^{9},7,13,15,17	+
27)	-	F	5	1^{5},2^{+},12	-
28)	+	M,U	4	1^{1},2^{11},6,9^{7}/14	-
29)	+	U	3	3m,1^{9},5^{7}/9,15,16	-
30)	+	A,GF	6	1^{1}/11m	-
31)	-	F	3	1^{2},2^{7},4^{11},7,11,16	+
32)	+	GF	4	2^{3}/5,10,14,15	-
33)	+	F	5	2^{7},5	-
34)	+	F	0	1^{4},4^{4},5,9	-
35)	-	F	2	2^{1},4^{9},6,9,11,13,18	+
36)	+	U	4	2^{6},4^{5}	+
37)	-	F	3	2^{7},4^{o},6,8,9,11,13,15,18	+
38)	-	F	2	8m,2^{11},5^{4},7^{4},9^{5}	+
39)	-	F	3	1^{4},2^{7},6,8,11,16/1^{4}	-
40)	-	F	3	1^{o},6,8,12,16	+
41)	+	F	3	1m,2^{3},4^{2}	+
42)	-	F	6	7m,2^{o},4^{1},6	+
43)	+	F	3	4m,2^{3},4^{4},6^{4}	+
44)	-	S	2	10m,2^{8},3^{7},8,11,13,14,17	+
45)	+	F	0	1^{4},6,7,16	-
46)	-	F	2	2^{11},4,6,7,11	+
47)	-	F	4	1^{2}	+
48)	-	F	1	2^{2},3^{1}	+
49)	-	F	5	2^{2},4^{1},7,8,11,13/17	+
50)	+	F	2	2^{0},4^{2},5,10,11,14	+

+ yes
- no

S=son
F=father
A=aunt
M=mother

GM=grandmother
GF=grandfather
U=uncle

Question	(6)	(7)	(8)	(8a)
Family				
26)	M,GM	1	L	grow fat
27)	F,M,S	4	oranges	vitamins
28)	M,GM,U,A	3	L	DK
29)	M,GM,U,A	2	L	agrees well
30)	M,GM,A	3	L	vitamins
31)	F,M	2	L	vitamins
32)	M,GM,GF,A,U	2	carrots	vitamins
33)	M,GM,GF	1	L	composes one
34)	F,M,GM,U	2	green veg.	gives force
35)	F,M	2	meat	nourishes
36)	M,GM,U	1	carrot juice	vitamins
37)	F,M,Fr	2	L	DK
38)	F,M	1	L	DK
39)	F,M,A	2	L	brings them up
40)	F,M	2	L	DK
41)	F,M,GF,GM	2	L	nourishes
42)	F,M	2	green veg.	vitamins
43)	F,M,GM,GF	2	meat	makes meal appeal
44)	M	2	L	vitamins
45)	F,M,GF,GM	3	L	nourishes
46)	F,M	1	meat	nourishes
47)	F,M	1	L	fattens more rapidly
48)	F,M	1	L	nourishes
49)	F,M	3	L	nourishing
50)	F,M,GM,U,A	3	L	fattens

M=mother
GM=grandmother
F=father
GF=grandfather
U=uncle
A=aunt
Fr=friend
S=son
L=milk
DK=don't know

Question	(9)	(10)	(10a)	(11)	(11a)	(11b)	(12)
Family							
26)	2^{9}	K+V	+	2^{9}	1B	2	7,13,15,17
27)	$1^{5},2^{+},12$	V	+	1^{5}	2C	2	+
28)	$1^{1},2^{11},6,9^{7}$	K+V	+	1^{11}	4C	5	+
29)	1^{9}	V	-	1^{9}	3C	-	5^{7},9,15,16
30)	1^{1},11m	V	+	11m	1B	3	+
31)	$1^{2},2^{7}$	V	-	1^{2}	1C	-	4^{11},7,11,16
32)	2^{3},5	V	-	2^{3}	1C	-	10,14,15
33)	2^{7}	V	-	2^{7}	2C	-	+
34)	1^{4}	V	-	1^{4}	DK	-	4^{4},5,9
35)	$2^{1},4^{9}$	V	-	2^{1}	1B	-	6,9,11,13,18
36)	$2^{6},4^{5}$	V	-	4^{5}	3C	-	+
37)	0	V	-	2^{7}	1B	-	+
38)	0	V	-	X	X	-	-
39)	$1^{4},1^{4}$	K	+	1^{4}	4C	2	2^{7},6,8,11,16
40)	1^{o},6,8,12,16	V	-	6	2C	-	+
41)	1m,2^{3},4^{2}	V	+	4^{2}	1C	2½	+
42)	7m,2^{o},4^{1},6	K	+	7m	1L	4	+
43)	4m,2^{3}	PS	+	2^{3}	1C	2	4,6
44)	10m,2^{8}	V	+	2^{8}	1B	2	3^{7},8,11
45)	1^{4}	K	+	1^{4}	3C	3	6,7
46)	0	X	X	X	X	X	-
47)	1^{2}	K	+	1^{2}	4C	5	+
48)	0	V	+	2^{2}	2C	1	-
49)	2^{2}	V	+	2^{2}	1B	1	4,7,8,11
50)	2^{o}	V	-	2^{o}	DK	-	4^{2},5,10,11,14

M=mother
F=father
GM=grandmother
K=Klim
V=fresh cow
N=Nido
Po=powder
X=not applicable
PS=powder skim
L=liter
+ yes
- no
C=cup
B=bottle
DK=don't know

Question	(13)	(14)	(16)	(17)	(19)	(20)
Family						
26)	tdy	1d	1B	no	2	DK
27)	10d	1d	1B	no	2m	DK
28)	1d	3d	1P	no	10	patroness
29)	4m	DK	1B	nuns	1½	niece
30)	2d	1d	1L	no	1	neighbor
31)	1d	1d	1B	no	11	DK
32)	4m	DK	1L	no	2	DK
33)	1d	1d	1B	no	10	everyone knows
34)	20d	1d	2B	CSM	DK	DK
35)	tdy	1d	2B	no	3	doctor
36)	1d	1d	2B	no	3	Methodists
37)	1d	DK	2B	no	18	neighbor
38)	6m	DK	1B	no	7	husband
39)	15d	2d	1P	no	16	DK
40)	tdy	1d	2B	no	4	DK
41)	2d	2d	1B	nuns	1	my mother
42)	4d	8d	1P	no	6	neighbor
43)	3d	DK	1P	nuns	6	doctor
44)	1d	1d	1B	no	0-1	doctor
45)	5d	4d	½P	no	3m	nurse
46)	N	DK	-	no	2	neighbor
47)	1d	4d	1P	Villa Busch	3m	DK
48)	3wk	DK	1B	no	2	DK
49)	1d	1d	1B	no	2	neighbor
50)	2m	DK	1B	no	2	sister-in-law

tdy-today
d=day
m=month
wk=week

N=never
DK=don't know
P=pound
B=bottle

L=liter
CSM=distribution program

Question	(21)	(21a)	(23)	(24)	(25)	(26)	(26a)
Family							
26)	+	12	3°	3B/d	+	+	2B/d
27)	+	10d	10m	2B/d	+	+	1C/d
28)	+	12	3	2P/wk	+	-	X
29)	+	2	7	1B/d	+	+	3C/d
30)	-	X	7	1½L/d	+	+	2C/d
31)	+	12	4	2B/d	+	+	2C/d
32)	+	5	3	2L/d	+	+	1C/d
33)	+	18	5	2B/d	+	+	2B/d
34)	+	14	3	2B/d	+	+	1B/d
35)	+	24	5	3B/d	+	+	1B/d
36)	+	12	8	2B/d	+	+	2C/d
37)	+	12	5	5B/d	+	+	1B/d
38)	+	14	8	5B/d	+	+	1B/d
39)	+	14	2°	1P/wk	-	-	X
40)	+	12	12	2B/d	+	+	1B/d
41)	+	18	2-3	2B/d	-	-	X
42)	+	3	18	2L/d	+	+	1L/d
43)	+	12	3	1P/wk	+	+	1B/d
44)	+	15	2	3B/d	-	-	X
45)	+	16	3	DK	+	+	3C/d
46)	+	18	8	2B/d	+	+	3C/d
47)	+	11	2	1P/wk	-	-	X
48)	+	20	3	1B/d	+	+	1B/d
49)	+	20	2	2B/d	-	-	1B/d
50)	+	24	3	1P/wk	+	+	DK

+ yes
- no
m=month
B=bottle
L=liter
P=pound
d=day
wk=week

Question	(27)	(28)	(29)	(30)
Family				
26)	L	12	K	develop healthy and fat
27)	tonic	15d	K	they like it
28)	L	8	K	walk very quickly
29)	L	9	V	has much fat
30)	L	12	V	vitamins
31)	L	12	K	same as breast
32)	L	9	V	DK
33)	L	18	K	nourishes
34)		12	V	fattens them
35)	L	24	V	nourishes
36)	juice	9	N	vitamins
37)	L	12	N	Dr. recommends
38)	L	12	V	proteins
39)	L	7	K	DK
40)	L	12	V	grow healthy
41)	corn starch	9	K	grow more healthy
42)	L	9	V	helps the blood
43)	L	18	K	DK
44)	tonic	12	K	grow healthy
45)	L	12	V	DK
46)	L	18	V	nourishes and maintains
47)	juice	12	K	they grow fast
48)	L	12	V	stronger food
49)	juice	10	K	nourishing
50)	L	10	K	fattens them faster

L=milk
units=months
d=days

V=fresh cow
K=Klim
N=Nido

Question	(30a)	(31)	(32)	(32a)	(33)
Family					
26)	my mother	DK	-	105	0
27)	myself	30	+	60	F
28)	D	210	-	DK	DK
29)	a woman	140	-	DK	0
30)	health station	70	-	30	DK
31)	myself	105	+	60	Ma,J
32)	D	105	-	90	0
33)	myself	70	+	DK	0
34)	D	50	+	60	Ju
35)	myself	50	+	72	0
36)	D	70	-	125	F-Ju
37)	my mother	140	+	60	0
38)	my husband	140	+	DK	D-Mar
39)	patroness	140	+	60	9
40)	D	70	+	60	Ja,F
41)	patroness	35	+	90	AP
42)	my mother	55	-	0	12
43)	D	105	+	72	Ja,F
44)	D	70	-	60	J,Ju
45)	nurse	70	+	60	0
46)	nuns	140	+	105	8
47)	D	60	+	100	0
48)	patroness	60	+	60	0
49)	patroness	70	+	115	0
50)	myself	140	+	60	N,D

D=doctor
+ yes
- no

0=none
Ja=January
F=February
Mar=March
Ap=April
Ma=May
J=June
Ju=July
Oc=October
N= November
D=December

Question	(34)	(35a)
Family		
26)	grocer	grocer
27)	AL	vendor in market
28)	Housebuilder	servant
29)	chauffer	0
30)	servant	servant
31)	housebuilder	sells roasts
32)	shoemaker	vendor in market
33)	AL	0
34)	AL	washerwoman
35)	AL	bakes
36)	chauffer	seamstress
37)	AL	baker
38)	topographer	0
39)	AL	vendor in market
40)	Al	bakes
41)	slaughterer	0
42)	technician	sells fruit
43)	AL	0
44)	AL	0
45)	AL	cook
46)	brickmaker	0
47)	mechanic	0
48)	AL	0
49)	factory	washerwoman
50)	AL	0

AL=agricultural laborer 0=none

Question	(35b)	(A)	(B)	(C)	(D)
Family					
26)	105	+	-	X	X
27)	30	-	-	2	2m,3m,
28)	40	+	-	0	X
29)	0	-	+	0	X
30)	25	+	-	1	2d
31)	25	-	-	3	newborn,2,3
32)	10	-	-	1	1m
33)	0	-	-	X	X
34)	30	-	-	4	8m,1^5,1^6,3
35)	20	+	-	1	7
36)	30	-	-	0	X
37)	60	-	-	1	2d
38)	0	-	-	0	X
39)	45	-	-	2	5d,7d
40)	30	-	-	0	X
41)	0	-	-	-	X
42)	60	+	-	-	X
43)	0	+	-	-	X
44)	0	-	-	1	6
45)	25	+	-	-	X
46)	0	-	+	2	3m,5
47)	0	+	-	-	X
48)	0	-	-	3	2m,8m,1
49)	20	-	-	-	X
50)	0	-	-	1	1^9

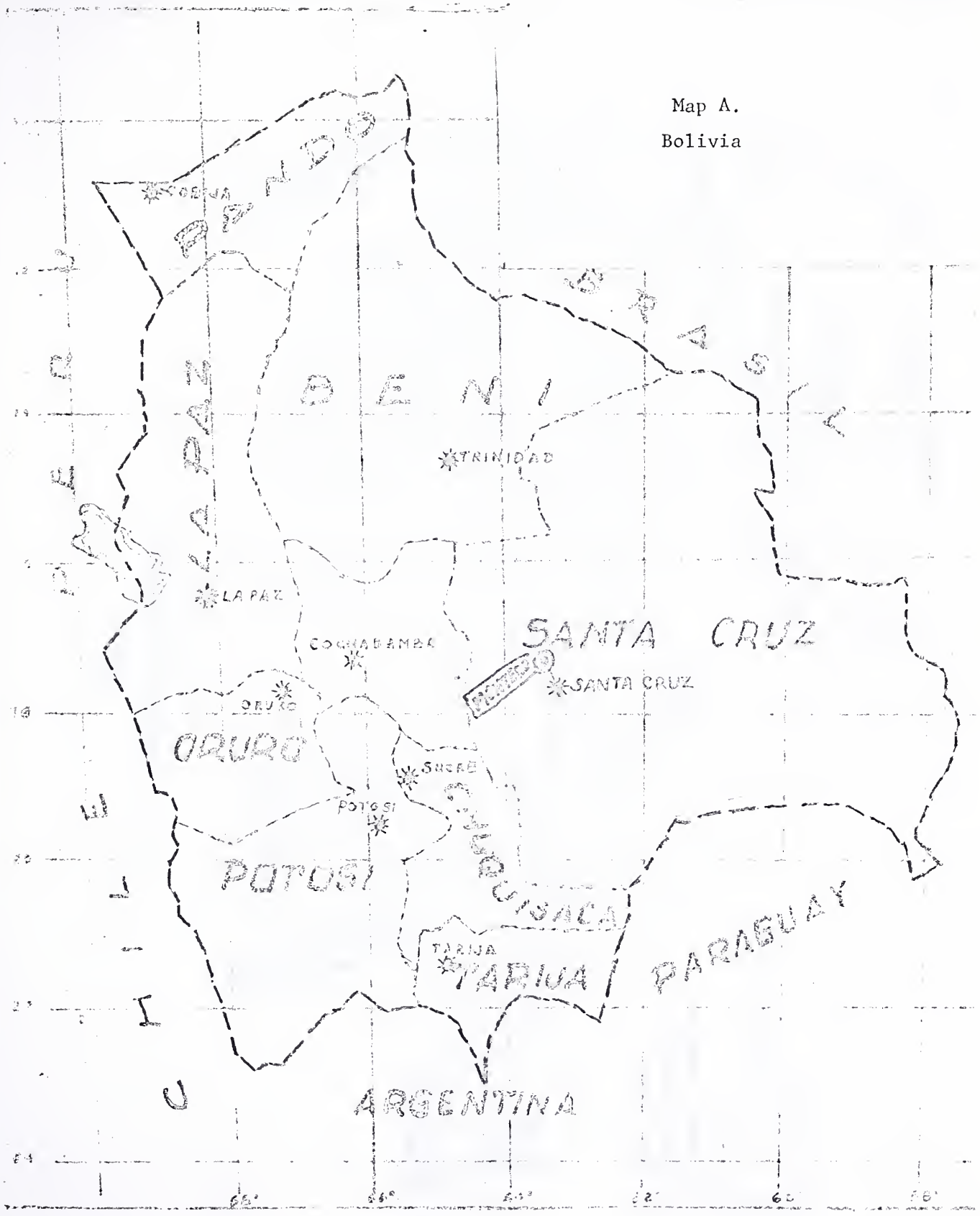
+ knows

- does not know

X not asked

Question	(E)	(F)
Family		
26)	vegetable soup, meat	M
27)	X	daughter
28)	X	M,GM
29)	potatoes, milk, family food	M
30)	X	M,GM
31)	family food	M,daughter
32)	X	M
33)	soup,meat, eggs,corn starch	GM
34)	X	M
35)	X	M,daughter
36)	X	M
37)	X	M,daughter
38)	X	M
39)	vegetable soup	M
40)	cinnamon water, bread, tea, milk	M
41)	milk, family food, soup	M
42)	X	M
43)	X	M
44)	vegetable and wheat soup, milk	M
45)	X	M
46)	rice, rice water, soup	M
47)	X	M
48)	X	M
49)	vegetable soup, family food, milk	M,daughter
50)	X	M

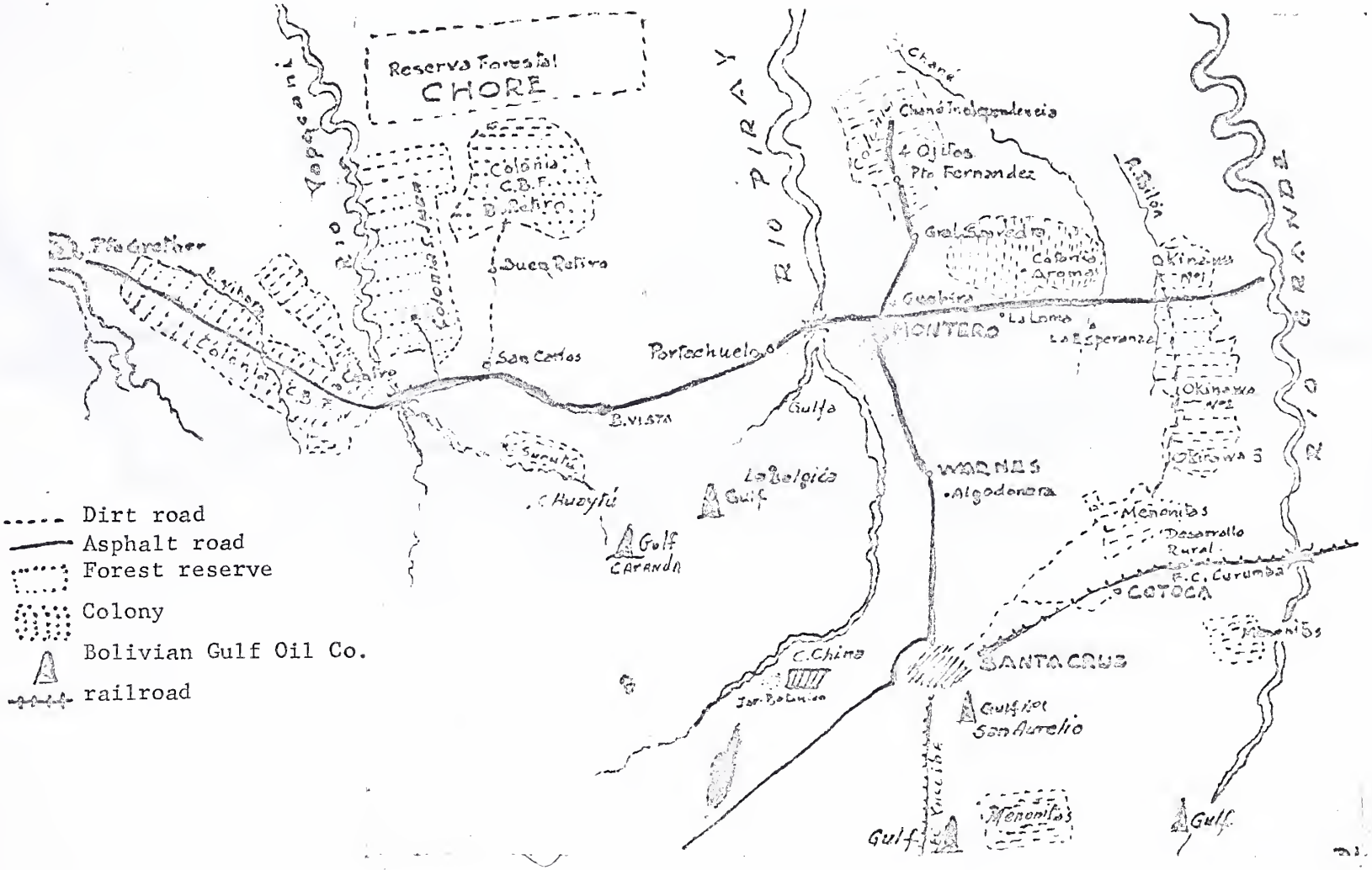
Map A.
Bolivia



Map B.

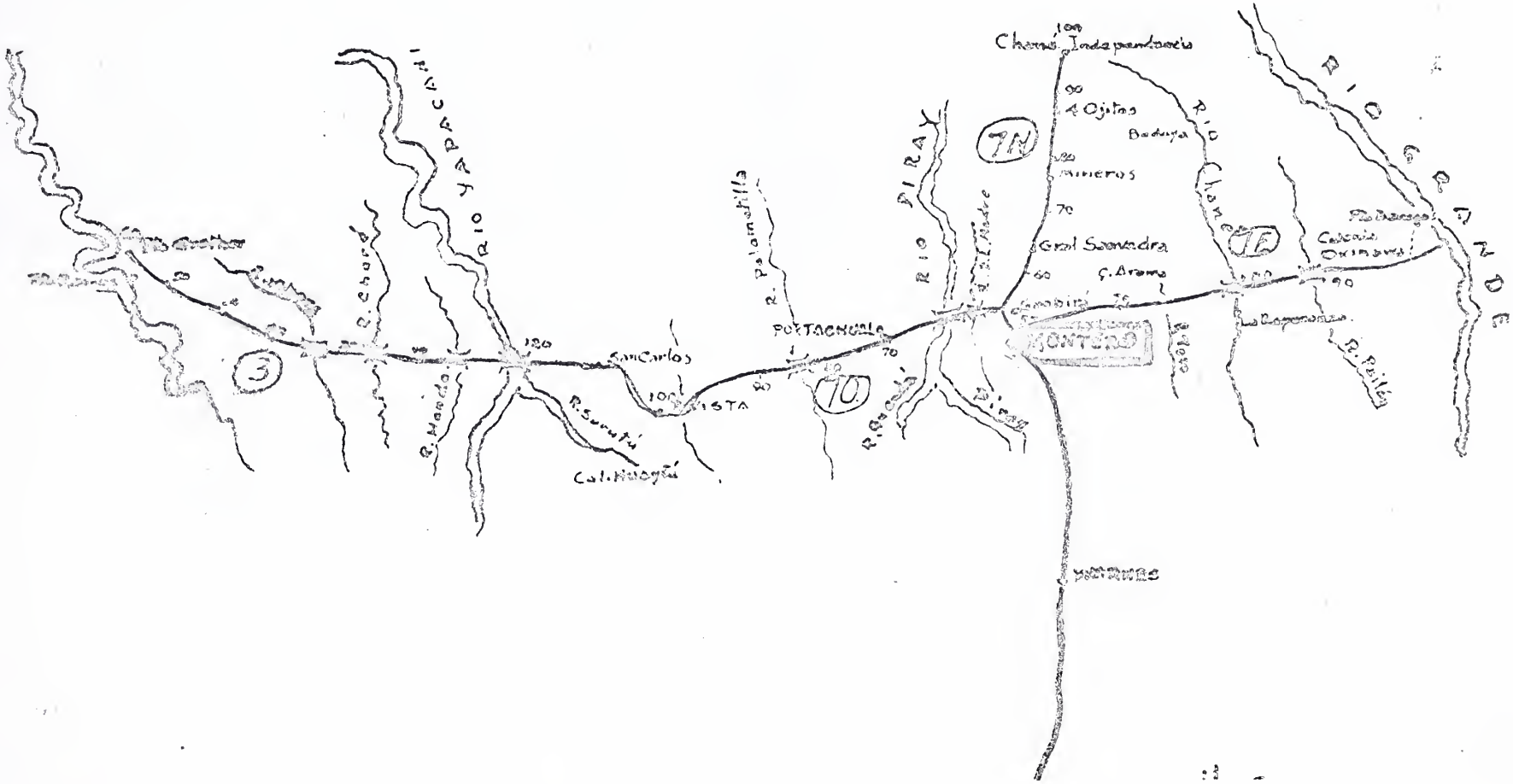
Agricultural Colonies

in Santa Cruz



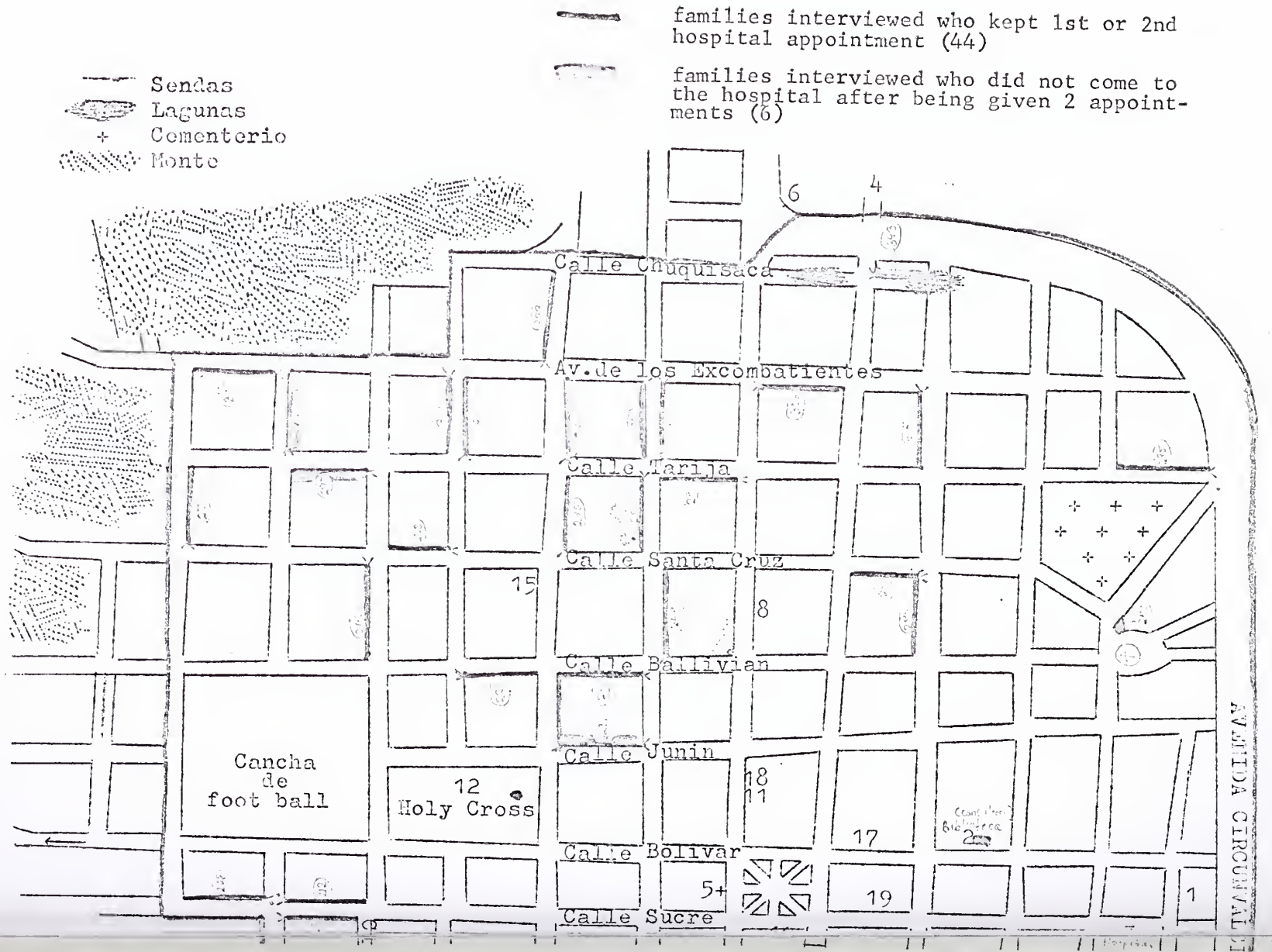
Map C.

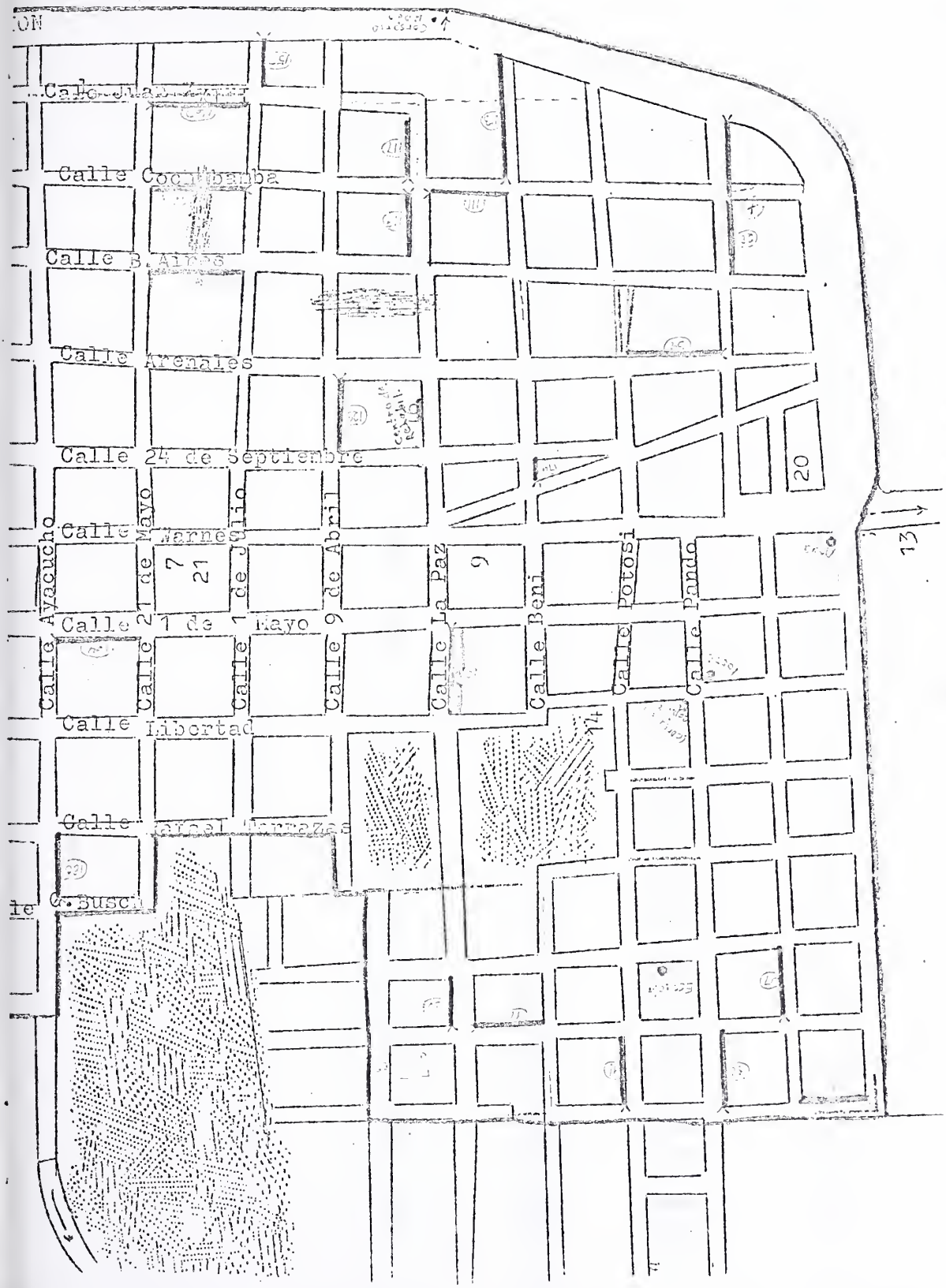
Colonization Roads Originating In Montero



Map D.

Street Plan of Montero


families interviewed who kept 1st or 2nd hospital appointment (44)
families interviewed who did not come to the hospital after being given 2 appointments (6)
Sendas
Lagunas
Cementerio
Monte
6
4
Calle Chuquisaca
Av.de los Excombatientes
Calle Tarija
Calle Santa Cruz
15
8
Calle Ballivian
Calle Junin
Cancha de foot ball
12
Holy Cross
18
11
17
19
5+
Calle Bolivar
Calle Sucre
1
AVENIDA CIRCUNVAL


Calle Cochabamba
Calle B. Aires
Calle Arenales
Calle 24 de Septiembre
Calle Ayacucho
Calle 21 de Mayo
Calle 1 de Julio
Calle 9 de Abril
Calle La Paz
Calle Beni
Calle Potosi
Calle Pando
Calle 1 de Mayo
Calle Libertad
Calle Arce
7
21
9
20
13
14

Appendix V.

Weights of Children under Five Years of Age

Interview Number	Age (months)	Weight (kg)	% of std. wt.	level underweight	degree of malnutrition
1	12	8.5	80+	1	M
2	7	9.5	100+	0	0
	35	14.0	90+	0	0
5	13	11.0	100+	0	0
	32	16.5	100+	0	0
7	2	6.0	100+	0	0
	25	10.5	80+	1	M
8	32	14.0	100+	0	0
	50	14.5	80+	1	M
9	21	10.5	80+	1	M
10	12	7.5	70+	2	M
11	15	6.0	60-	4	S
	42	12.5	80+	1	M
12	2	5.5	100+	0	0
	34	12.5	80+	1	M
	57	14.5	80+	1	M
13	25	9.5	70+	2	M
	45	15.0	90+	0	0
14	9	8.0	90	1	M
	31	12.0	80+	1	M
16	24	8.0	60+	3	M
	47	13.0	70+	2	M
17	8	7.5	80+	1	M
	26	11.0	80+	1	M

M is mild-moderate S is severe O is none

Interview Number	Age (months)	Weight (kg)	% of std. wt.	level underweight	degree of malnutrition
18	19	9.5	80+	1	M
	42	13.5	80+	1	M
19	21	11.0	90+	0	0
20	14	8.5	80+	1	M
	43	14.5	80+	0	0
21	11	7.5	70+	2	M
	35	13.0	90+	0	0
22	21	9.5	70+	2	M
	53	14.5	80+	1	M
23	23	11.0	80+	1	M
24	31	11.5	80+	1	M
	44	15.5	90+	0	0
	15	9.5	90	1	M
25	32	11.5	80+	1	M
	45	14.0	80+	1	M
	54	15.0	80+	1	M
27	17	8.5	70+	2	M
28	13	10.0	90+	0	0
	35	14.5	100+	0	0
29	3	6.0	100+	0	0
30	11	7.0	70+	2	M
	13	6.5	60+	3	M
31	14	7.5	70+	2	M
	31	12.5	90+	0	0
	59	16.5	90+	0	0
32	27	9.5	70+	2	M
33	31	11.0	80	2	M
34	16	6.5	60-	4	S
	52	13.0	70+	2	M
35	15	5.5	60-	4	S
	35	13.5	90+	0	0
	57	13.5	70+	2	M

M is mild-moderate S is severe 0 is none

Interview Number	Age (months)	Weight (kg)	% of std. wt.	level underweight	degree of malnutrition
36	30	13.0	90+	0	0
	53	18.0	100+	0	0
37	31	10.5	70+	2	M
	48	13.5	80+	1	M
38	8	8.5	100+	0	0
	35	11.5	80	2	M
39	16	9.0	80+	1	M
	16	9.5	80+	1	M
	31	13.5	90+	0	0
40	12	8.0	80+	1	M
41	1	4.0	90+	0	0
	27	12.5	90+	0	0
	50	12.5	70+	2	M
42	6	6.5	80+	1	M
	24	11.0	80+	1	M
	49	13.0	70+	2	M
43	4	6.5	100+	0	0
	27	11.0	80+	1	M
	52	18.0	100+	0	0
44	10	8.0	80+	1	M
	32	9.5	60+	3	M
	43	15.5	90+	0	0
45	16	8.5	70+	2	M
46	35	12.0	80+	1	M
	55	15.0	80+	1	M
47	14	10.0	90+	0	0
48	26	10.5	80+	1	M
	37	15.5	100+	0	0
50	24	11.0	80+	1	M
	50	16.0	90+	0	0

M is mild-moderate S is severe 0 is none

BIBLIOGRAPHY

1. Acheson, R.M. (1960) Effects of nutrition and disease on human growth. In: Human Growth (symposia of the Society for the Study of Human Biology, Vol. 3), ed. J.M. Tanner, Pergamon Press, Oxford, p.73.

2. Albanese, A.A. (1951) Protein and amino acid requirements of infants. Pediatrics, 8:455.

3. Behar, M., Viteri, F., Bressani, R., Arroyave, G., Squibb, R. and Scrimshaw, N. (1958) Principles of treatment and prevention of severe protein malnutrition in children (Kwashiorkor). Ann. N.Y. Acad. of Sci. 69:954.

4. Bressani, R. and Behar, M. (1964) The use of plant protein foods in preventing malnutrition. In: Proceedings of the Sixth International Congress of Nutrition, Edinburgh, E. & S. Livingstone Ltd., pp.181-206.

5. Burgess, A. and Dean, R.F.A. (1962) ed. Malnutrition and Food Habits, Tavistock, London.

6. Downs, E.F. (1964) Nutritional dwarfing, a syndrome of early protein-calorie malnutrition. Amer. J. Clin. Nutr., 15:275.

7. FAO (1964) Protein: At the heart of the world food problem, World Food Problems No. 5, Food and Agriculture Organization, Rome.

8. FAO/WHO Expert Group (1965) Protein Requirements. FAO Nutrition Meetings Report Series No. 37, Food and Agriculture Organization, Rome.

9. Ford, F.J. (1964) Can a standard for "malnutrition" in childhood be devised? J. Trop. Pediat. 10:47.

10. Gomez, F., Ramos-Galvan, R., Cravioto, J. and Frenk, S. (1954) Malnutrition and Kwashiorkor. Acta. Pediat. (suppl. 100). 43:336.

11. Gomez, F., Galvan, R.R., Cravioto, J. and Frenk, S. (1955) Malnutrition in infancy and childhood with special reference to Kwashiorkor. In: Levine, S. (ed.) Advances in Pediatrics, New York, Year Book Publishers, vol. 7, p.131.

12. Gopalan, C. (1956) Protein intake of breast-fed poor Indian infants. J. Trop. Pediat. 2:89.

13. Graham, W.R. (1965) The role of the food industry in the development of Incaparina. WHO/FAO/UNICEF, Protein Advisory Group, News Bulletin No. 5, United Nations, New York

14. INCAP (1964) Tabla de composicion de alimentos para uso en America Latina. Instituto de Nutricion de Centro America y Panama. Centro Regional de Ayuda Tecnica, Mexico.

15. Jamaica Conference (1955) "Protein Malnutrition". Report of a conference in Jamaica, 1953, sponsored jointly by FAO, WHO and the Josiah Macy Dr. Foundation. (J.C. Waterlow, ed.) FAO, Rome

16. Jelliffe, D.B. (1957) Infant nutrition in the subtropics and tropics, WHO monograph Series No. 29, Geneva.

17. Jelliffe, D.B. (1957) Cultural blocks and protein malnutrition of early childhood in rural West Bengal, Pediat. 20:128.

18. Jelliffe, D.B. (1966) The assessment of the nutritional status of the community, WHO monograph Series No. 53, Geneva.

19. Jelliffe, D.B. and Jelliffe, E.F.P. (1960) The prevalence of protein-calorie malnutrition of early childhood in Haiti. Amer. J. Publ. Hlth. 50:1355.

20. Kapsiotis, G.D. (1967) A list of protein food mixtures, PAG Bulletin 7, FAO/WHO/UNICEF Protein Advisory Group, United Nations Headquarters, New York.

21. McKenzie, J.C. and Yadkin, J. (1964) Conspectus. In: Changing Food Habits, J. Yadkin and J.C. McKenzie, eds., London, MacGibbon, p.135.

22. Patwardhan, V.N. (1964) Protein-calorie deficiency disease - Public Health aspects. In: Proceedings of the Sixth International Congress of Nutrition, Edinburgh, E. & S. Livingstone Ltd., pp.310-322.

23. Scrimshaw, N.S. and Behar, M. (1965) Malnutrition in underdeveloped countries. N. Eng. J. Med., 272:137.

24. Scrimshaw, N.S. and Bressani, R. (1961) Vegetable protein mixtures for human consumption. Fed. Proc. 20:80 (suppl. 7)

25. Senecal, J (1957) Human Protein Requirements and their Fulfillment in Practice. Report of a conference at Princeton, U.S.A. 1955. (J.C. Waterlow and J.M.L. Stephen, eds.) FAO, Rome p.77

26. Senecal, J. (1958) The treatment and prevention of Kwashiorkor in French West Africa. Ann. N.Y. Acad. of Sci., 69:916.

27. Swaminathan, M. (1967) Nutrition and the world food problem, Bord. Rev. Nutr. Res. 28:1.

28. Tepley, L.J. (1965) Role of milk and milk products in nutrition in tropical and subtropical countries. Jnl. of Dairy Sci., 48:1547.

29. Trowell, H.C., Davis, J.N.P. and Dean R.F.A. (1954) Kwashiorkor, London, Arnold.

30. UNESCO (1966) The mild conservation Programme: an appraisal of UNICEF/FAO-assisted milk conservation programs, 1948-1966. E/ICEF/L. 1257, United Nations Children's Fund, United Nations Headquarters, New York

31. Vaughan, V. (1964) Growth and development of the infant and child. In: Nelson, W.E., ed. Textbook of Pediatrics, 8th Edition, Saunders, Philadelphia. pp.14-60.

32. Waterlow, J.C. (1948) Fatty liver disease in infants in the British West Indies. Med. Research Council (Brit.) Spec. Dept. No. 263.

33. Waterlow, J.C., Cravioto, S. and Stephen, J.L. (1960) Protein malnutrition in man, Advances in Protein Chemistry, 15:143.

34. Wharton, B.A., Jelliffe, D.B. and Stanfield, J.P. (1968) Do we know how to treat Kwashiorkor? J. Pediat. 72:721-726.

35. Williams, C.D. (1933) A nutritional disease of children associated with a maize diet. Arch. Dis. Childh. 8:423.

36. Williams, C.D. (1935) Kwashiorkor, A nutritional disease of children associated with a maize diet. Lancet vol. II. p.1151

YALE MEDICAL LIBRARY

Manuscript Theses

Unpublished theses submitted for the Master's and Doctor's degrees and deposited in the Yale Medical Library are to be used only with due regard to the rights of the authors. Bibliographical references may be noted, but passages must not be copied without permission of the authors, and without proper credit being given in subsequent written or published work.

This thesis by has been used by the following persons, whose signatures attest their acceptance of the above restrictions.

NAME AND ADDRESS	DATE
K. OHENE-FREMPONG 333 CEDAR ST. NEW HAVEN	9/30/74